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SCHOOL ACHIEVEMENT AND EFFECT OF TYPE SIZE ON READING IN VISUALLY HANDICAPPED CHILDREN.
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*READING ACHIEVEMENT, *VISUALLY HANDICAPPED, *READING SKILLS, *SPECIAL EDUCATION, *ACHIEVEMENT TESTS, GRADE 5, GRADE 6, WRITTEN LANGUAGE, COMPARATIVE ANALYSIS, PITTSBURGH, PENNSYLVANIA

THE RELATIONSHIP BETWEEN VISUAL DEFICITS AND ACHIEVEMENT WAS STUDIED. PARTIALLY SEEING CHILDREN (424) FROM THE FIFTH AND SIXTH GRADES WERE ADMINISTERED FIVE EQUIVALENT FORMS OF A STANDARDIZED TEST CONTAINING SCHOOL-LIKE READING TASKS. A LATIN SQUARE DESIGN WAS USED TO SPREAD THE EFFECTS OF TEACHERS' SKILL IN TEST ADMINISTRATION, PRACTICE, LEVELS OF PUPIL MOTIVATION, AND POSSIBLE EFFECTS OF TYPE SIZE CHANGE. VARIOUS DATA ON THE SUBJECTS WERE OBTAINED FROM THEIR TEACHERS. A COMPREHENSIVE ACHIEVEMENT TEST WAS LATER PRINTED IN TYPE SIZES 12-, 15-, 18-, 21-, AND 24-POINT, AND ADMINISTERED ACCORDING TO THE PREFERENCE OF THE SUBJECTS. THIS TEST WAS ADMINISTERED UNDER BOTH TIMED AND UNTIMED CONDITIONS. DATA WERE COLLECTED ON READING DISTANCE EMPLOYED AND OTHER VARIABLES. STATISTICAL ANALYSIS REVEALED NO RELATIONSHIP BETWEEN THE BEST TYPE SIZE AND ACHIEVEMENT OR BETWEEN THE READING DISTANCE TYPICALLY USED AND TEST SCORES. THERE WAS EDUCATIONAL RETARDATION OF ONE GRADE LEVEL ON A GRADE-TO-GRADE COMPARISON WITH NONHANDICAPPED CHILDREN. OTHER RESULTS, IMPLICATIONS, AND CONCLUSIONS CONCERNING (1) SPECIAL EDUCATION PRACTICES, (2) TEACHER EDUCATION, (3) VOCATIONAL REHABILITATION, AND (4) RESEARCH WERE INCLUDED. (RS)

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SCHOOL ACHIEVEMENT AND EFFECT OF TYPE SIZE ON READING IN VISUALLY HANDICAPPED CHILDREN

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Contract No. OE 4-10-028

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1966

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Jack W. Birch
Principal Investigator
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INTRODUCTION

Special education for children who fall between those who are blind and those who have enough sight for regular classroom instruction began almost 60 years ago in London. Now called the partially seeing, such children require instructional materials and procedures different from the blind and different from those with normal vision. As defined by Hathaway (1959) and as defined in many state regulations regarding their education, they are children with visual acuity between 20/70 and 20/200 in the better eye with optimum correction, or with other visual deviations which, in the opinion of eye specialists, call for special education. Educationally, they are visually limited children who can use enlarged ink print or limited amounts of regular print under special conditions as a major mode of instruction rather than braille.

There has been little research on the school achievement of partially seeing children. Nor has there been much research on the type sizes most appropriate for their instructional materials. In neither case has research to date been definitive.

The limitations of existing research prompted a study aimed at testing certain hypotheses as well as providing additional data on school achievement and type size. The investigation reported here began August 1, 1963 and ended December 31, 1965. Hopefully, it should furnish a stronger foundation for special education practices and form a basis for even more definitive work toward solving the many educational problems in this small but important field.

STATEMENT OF THE PROBLEM

Jones (1961 p. 34) noted the urgent need for information from research concerning the reading performance of children with very low vision. He commented:

"Now that the fear of damaging through use the residual vision of most children with moderate to severe impairments has been removed, the door to experimental research on this educational problem has been flung wide open. Controlled studies isolating some of the suspected variables could bring much understanding to this area of special education. They could substantiate the intuitive knowledge held by special educators and make possible dissemination of information which would be helpful to teachers."

There is very little information on the reading and on the school achievements of partially seeing children. There are no broad-scale comparisons with expected achievements of non-handicapped children. Such data would be significant as a basis for experimental research, for better understanding of the educational problems of partially sighted children and for adjusting curricula to meet their problems.

With regard to type-size, according to Hathaway (1959, p. 116), "Some children, even with very limited vision, can read small print more easily than large print, and need to be encouraged to do so. It is only through repeated trials with varying sizes of type that [the teacher] can determine the one best suited to [the child's] needs and encourage his use of it."

Virtually no research evidence exists to aid the teacher in the task referred to by Hathaway. While enlargement of the print in books is a widely used provision for the special education of partially seeing children, there is little objective basis for it. Selection of type size has been a source of considerable controversy, and decisions favoring either 24 or 18 point, the sizes most commonly used, have been largely on the basis of experience and tradition.

The problem approached by this investigation is the collection and analysis of data to the end that (a) the school achievement of partially seeing children can be known and understood and (b) that criteria can be established for type size to be used in special printed or enlarged instructional materials.

The following hypotheses were to be tested:

1. Reading speed and comprehension of partially seeing children is positively related to size of type.
2. Reading speed and comprehension of partially seeing children is inversely related to severity of visual disability.
3. Reading speed and comprehension of partially seeing children is negatively related to decrease in visual acuity.
4. The academic achievement of partially seeing children is equivalent to the achievement of non-handicapped children under power test conditions.

It was found that the second hypothesis could not be tested. Data on visual disabilities were not available in a form which allowed them to be ordered according to degree of severity. Instead, a fifth hypothesis was added, as follows.

5. There are significant positive relationships among best type size, achievement and reading distance with partially seeing children.

It was expected that information and interpretations from the hypotheses and from other data analyses might:

1. Furnish objective criteria for selection of size of type suitable for a specific visual disability and visual acuity.
2. Provide comprehensive information on how partially seeing children achieve in reading, spelling, other language arts, arithmetic skills, social studies and science, and how their achievement compares with non-handicapped children.
3. Allow fuller comprehension of the intelligence, visual acuity, and the visual disabilities of partially seeing children, and their relationships to achievement.

REVIEW OF LITERATURE

The previous work of a research nature on type size and on school achievement in relation to partially seeing children is quite limited in amount and in scope. Also, the findings are equivocal.

Research on Type-Size

The history of research on type size for partially seeing school children (Eakin & McFarland, 1960) began in Cleveland, Ohio, in 1913, when Irwin had textbooks printed in 36 point clearface type. They were tried by teachers in 1914, and the reception was apparently not enthusiastic. Irwin tried other type sizes and styles in the following seven years, finding that 24 point Century Schoolbook and Caslon Bold types proved most popular with pupils and teachers. To the extent it is possible to determine, Irwin confined his investigations to 18, 24, 30, and 36 point sizes in seven styles of type. It is not clear from reports how the children and teachers were selected to participate in the investigations. Neither is it clear what criteria Irwin and his associates used in determining the significance of ratings given the various types by those testing them.

In some respects the reports are clear. For example, the children were allowed to hold the printed material where they could see it most easily. Also, the children read the material aloud. But there is not enough detail in the published descriptions of the studies to allow a replication of Irwin's early work or to otherwise evaluate its adequacy for guidance in planning the actual reading tasks of partially seeing school children.

Nevertheless, Irwin's work had a strong influence on instructional materials for special education. It was not until 23 years later that a research report ventured a challenge to the 24 point type standard commonly used in special textbooks. Fortner, (1943) in Oregon, reported a study comparing ease of reading in 18 and 24 point type under standardized conditions. In some respects the study was very well planned. The 56 children in Fortner's investigation were observed under conditions which did allow the possibility of a crucial test of the differences under consideration. The reporting of the study is full enough to permit at least a close approximation of replication. However, the Fortner work foundered on the dual problems of criterion and measurement. Eye blink rate was used along with ratings by the children as criteria for ease of reading. The findings were inconclusive, and the study produced no significant results.

It was almost ten years later that another attempt was made to extend the type-size research horizons first approached by Irwin. As reported by Eakin, Pratt and McFarland (1961) an effort had been made in 1952 to compare the readability of three sizes of type, 12, 18 and 24 point, under the condition of a standard distance of 14 inches. Three hundred and thirty-seven partially seeing children made up the sample. The study's stated purpose was to determine differences in the ability of the subjects to use the type presented. Unfortunately, lighting was not standardized. Also, the subjects were divided into groups, not all children receiving the same stimulus materials, and the comparability of the groups on relevant variables was not well established. For those and other methodological reasons the investigation was not conclusive.

By that time, however, there were two easily discernible schools of thought on size of type for instructional materials to be used with partially seeing children. Adherents of the 24 point size argued for their position. So did those married to the 18 point size. Since available research was open to either interpretation, the arguments continued.

Nolan (1959) attempted to resolve the issue with a well-designed study which permitted him to draw conclusions about interactions between type sizes and styles. He demonstrated that visually limited children read a serif type face (Antique Old Style) faster than a sans serif type face (Metromedium). But he found no significant difference in reading speed between 18 point and 24 point type sizes. That finding was interpreted in different ways by those already committed to one type size or the other.

The type size issue was raised in 1913 and to the date of beginning this study had remained unsettled in the minds of many of the special educators responsible for the selection of instructional materials for partially seeing children. The four studies reported did not provide an objective basis for decisions.

Research on School Achievement

The earliest information located which bears on the school achievement of the partially seeing is that of Peck (1925). She reported on the age-grade status of Cleveland's partially seeing children. When in the regular grades, 65.5% of the children were over-age for grade. Myers (1930) studied partially seeing children in Chicago, finding that the rate of promotion for such children was 73.1% when they were in regular grades.

Both Peck and Myers indicated that rate of promotion increased after the children were transferred from regular grades to special classes for the visually limited. That finding must be interpreted with caution, since neither of the studies gives direct information about the school achievement of the children. It is true that overageness in grade is often associated with limited achievement. Following that line of inference, the children's improvements in promotion rate after transfer from regular grades to special classes may have been attributable to accelerated achievement in language arts, arithmetic skills and in academic subjects. But that cannot be said with certainty.

The first information about the actual achievement of visually limited children must be credited also to Peck (1933) who reported another study in which she obtained reading test scores of 234 Cleveland children in grades 2 through 9. The Stanford Achievement Test in Reading was reproduced in large type for the purpose of the investigation.

The results indicated that the children had reading skills approximately consistent with the norms for the grades in which they were enrolled. That investigation did not provide information on achievement in such areas as arithmetic, history, literature and other parts of the elementary or secondary curriculum. While it did produce useful information about reading skills, and while reading skills are valuable indices to probable achievement in other components of the curriculum, any attempt to generalize from the findings needs special care. For example, the report of findings in terms of the norms for the grades in which the children were enrolled does not take into account the age-grade retardation reported in the previous studies by both Peck (1925) and Myers (1930). Although the children achieved well enough for the grades in which they were placed, they might have been at a disadvantage if compared with non-handicapped children of equivalent ages.

Earlier the studies of Eakin, Pratt and McFarland (1961) and of Nolan (1959) were cited on type-size. Both studies contributed information on another facet of school achievement, speed of reading. Both presented data suggesting that reading speed for partially seeing children was substantially slower than for non-handicapped children.

Next in chronological order was a series of pilot studies beginning in 1952 and culminating in a publication in 1955 from the Bureau of Educational Research of the Board of Education of the City of New York. Livingston, Justman, and Gilbert (1955) participated in the pilot studies of the sixth and eighth grade achievement of partially seeing children and edited the formal report entitled, "Sixth Grade Children with Visual Handicaps Enrolled in Sight Conservation Classes." The study was limited to New York City children. It dealt with academic achievement only so far as reading and arithmetic skills were concerned. Also, the sample of 116 sixth grade children was substantially below average in intelligence, with a mean intelligence quotient of 89. Despite such limitations on generalizability, the study deserves note as the most intensive and comprehensive one available in the literature. It had a longitudinal aspect in that measures were taken over a three year period. Attempts were made to study not only academic achievement but also intellectual and personality development and to relate those to achievement in school subjects.

Because they had used a large-type edition of the Stanford Achievement Test they did not apply the norms for grade equivalents which had been established for the test in its usual type size with normal children. Instead, they developed percentile scores for the visually limited population they examined and used those percentile scores, plus raw scores on the test, to effect comparisons within the group. Also, they developed standard scores from the raw scores of the achievement tests and from the intelligence tests and used those to make even more refined analyses of the relationship of expectancy based on mental ability and of achievement based on the standardized test of reading and arithmetic.

It can be determined from Livingston, Justman and Gilbert's report that there were no sex differences in achievement, that eighth grade children achieved above sixth grade children, that approximately one third of the pupils achieved above expectancy, another third at, and the remaining third below expectancy, and a number of other related details. However, the actual grade levels of achievement in reading and arithmetic are not reported nor how they compared with the national norms of the achievement test or with the grade levels of achievement of other non-handicapped New York City children.

Bateman's (1962) study is the most recent one to give information on school achievement of partially seeing children. She collected reading achievement data on 96 children in grades one through four in Illinois schools. Her group was of average intelligence. The children read at approximately six months below mental age and about one-half month below grade placement. Bateman's measures of reading achievement were made with the Monroe Tests, without type enlargement or time extensions.

When considering the seven studies bearing on school achievement referred to here, covering the 41 years from 1925 to date, several points stand out. One is the very small number of investigations which have been reported in four decades. Another is that only a few of the studies focused on obtaining measures of school achievement. Third, none of the research took a broad view of school achievement, but rather concentrated on only the aspects of the curriculum represented by reading and arithmetic. A fourth observation is that all of the work to date has been limited to the first nine grades; nothing is reported concerning achievement in the senior high school years. Most important of all, the investigations of school achievement to date have been, for a variety of methodological and sampling reasons, of limited generalizability.

It was the continuing uncertainty about type-size and school achievement in the education of partially seeing school children which prompted the present investigation aimed at furnishing additional information on those two topics.

PROCEDURE

Design of the Study

The requirements of the problem included first determining the effect of type size on reading among partially seeing children. Then, using the information on type size, it was necessary to investigate the school achievement of partially seeing students under the most favorable type size reading conditions. Also, the intent was to collect and use information on the visual disabilities and other characteristics of the partially seeing subjects and to study their relations to type size and to school achievement. To accomplish the above objectives called for a design which followed a series of steps, each step somewhat dependent upon the results of the preceding ones. The steps in the process are briefly noted here and elaborated in the remainder of this section of the report.

1. Determination of the sample of partially seeing children to be used.
2. Determination of identification information and other educationally relevant data to be obtained about the sample.
3. Selection of the tests and other instruments to be used in data collection on type size.
4. Administration of five equivalent tests, each in a different type size, to determine the effect of type size on reading.
5. Analysis of results to determine best type size to use for subjects when taking achievement tests.
6. Selection of tests and other instruments for further data collection.

7. Administration of tests of school achievement and collection of other relevant data.
8. Analysis of achievement test results and potentially related data to test hypotheses and answer the questions posed in the study.

Subjects

Four sample population groups are described in this section. First is the total group of fifth and sixth grade pupils originally enlisted for the study of partially seeing children. Second is the part of the fifth and sixth grade group which took the Metropolitan Achievement Test sequence. Third is the group which continued beyond that point and took the Stanford Achievement Test in the following school year. Fourth is a group of non-handicapped fifth and sixth grade children used in studying the relative effect of relaxing time limits on the standardized achievement tests.

Identifying Information Sample Population:

The primary source for information on the location of partially seeing children in special education programs in the United States was examined (Mackie, Williams and Robins, 1961). It was found that more than 3,600 school systems had reported 6,389 partially seeing children enrolled in elementary schools in all states as of February, 1958, the most recent date for which information was available. Assuming "elementary" to mean first grade through sixth grade for most school systems, each elementary grade contained approximately 1,000 students. Counting on some growth in enrollment in the intervening years, it was estimated that a total population of 2,000 students in grades five and six might be located for the study in 1963 and 1964.

Upon further investigation the number of children enrolled in many local programs proved too small and variable to justify attempts at inclusion in the study. As a result the number to be included was reduced to approximately 1,250. The informed judgment of experts was used in selecting a sample of fifteen states and the District of Columbia which might be representative of the varieties of special education for the partially seeing in the United States. The specialists who contributed opinions are indicated in Appendix A.

The project staff members made contact with the directors of special education in the selected states to obtain cooperation through them from the school systems having special education for partially seeing children. In three instances only large cities in the states were contacted.

The following states were represented in the sample.

California
Florida
Georgia
Illinois
Massachusetts
Maryland (1)
Michigan (2)
Missouri
New Jersey
New York
Ohio
Oregon
Pennsylvania
Texas (3)
Washington, D. C.
Wisconsin

1. Baltimore only
2. Detroit only
3. Austin only

The states and certain characteristics of the children in the initial sample are shown in Table 1. This sample is called the Identifying Information Sample Population (IISP), since it constitutes the entire group of subjects on which initial information was obtained. As will be seen, that group diminished in size due to a variety of factors during subsequent data collection.

TABLE 1

STATE OF RESIDENCE, GRADE PLACEMENT AND SEX OF IDENTIFYING INFORMATION SAMPLE POPULATION

State of Residence	Pupils In Fifth Grade			Pupils In Sixth Grade			Pupil Totals		
	M	F	T	M	F	T	M	F	T
California	29	26	55	35	28	63	64	54	118
Florida	8	8	16	4	2	6	12	10	22
Georgia	16	14	30	18	6	24	34	20	54
Illinois	38	33	71	36	26	62	74	59	133
Maryland	4	4	8	4	2	6	8	6	14
Massachusetts	10	2	12	16	5	21	26	7	33
Michigan	27	14	41	11	12	23	38	26	64
Missouri	14	4	18	10	8	18	24	12	36
New Jersey	4	2	6	9	6	15	13	8	21
New York	75	59	134	80	57	137	155	116	271
Ohio	35	23	58	41	31	72	76	54	130
Oregon	0	5	5	7	4	11	7	9	16
Pennsylvania	30	23	53	32	25	57	62	48	110
Texas	2	1	3	1	0	1	3	1	4
Washington, D.C.	5	7	12	2	2	4	7	9	16
Wisconsin	12	8	20	12	10	22	24	18	42
TOTALS	309	233	542	318	224	542	627	457	1,084
PERCENTAGES	55.1	44.9	100	56.7	43.3	100	57.8	42.2	100

Best Metropolitan Achievement Test Sample Population:

As indicated in the outline of the design of the study, five equivalent forms of a shortened version of the Metropolitan Achievement Test (MAT) were to be administered to all subjects. During the testing, which took several months, attrition occurred. Some children in the IISP dropped out without completing the test sequence. Illustrations of the many reasons for attrition are absences, illness, pupil transfers, teacher transfers, interference with teaching the regular curriculum, reorganization of schools, and losses in the mail.

For all subjects who completed the full sequence of five forms (and a few who completed only four) it was possible to determine a "best" Metropolitan Achievement Test score (Best MAT). States of residence and certain other characteristics of the 903 fifth and sixth grade children in the Best MAT Sample Population (Best MATSP) are shown in Table 2.

TABLE 2

STATE OF RESIDENCE, GRADE PLACEMENT AND SEX OF BEST MAT SAMPLE POPULATION

State of Residence	Pupils in Fifth Grade			Pupils in Sixth Grade			Pupil Totals		
	M	F	T	M	F	T	M	F	T
California	25	16	41	24	25	49	49	41	90
Florida	6	5	11	4	1	5	10	6	16
Georgia	12	10	22	15	6	21	27	16	43
Illinois	32	28	60	31	26	57	63	54	117
Maryland	4	4	8	4	2	6	8	6	14
Massachusetts	8	2	10	11	4	15	19	6	25
Michigan	25	11	36	8	9	17	33	20	53
Missouri	13	4	17	10	8	18	23	12	35
New Jersey	4	2	6	8	6	14	12	8	20
New York	56	44	100	65	50	115	121	94	215
Ohio	33	22	55	37	29	66	70	51	121
Oregon	0	5	5	7	4	11	7	9	16
Pennsylvania	23	21	44	28	24	52	51	45	96
Texas	2	1	3	1	0	1	3	1	4
Wisconsin	11	6	17	11	10	21	22	16	38
TOTALS	254	181	435	264	204	468	518	385	903

Stanford Achievement Test Sample Population:

After the Best MATSP was established, arrangements were made to administer the full Stanford Achievement Test (SAT) in type sizes most suitable to the students. At this point, further attrition occurred. In addition to the same reasons which accounted for loss of subjects in the MAT sequence, another very significant factor came into play. Because the MAT sequence had consumed so much time it was found inadvisable to attempt the SAT administration in the spring and early summer. School term closings, especially those in May, were too near. The SAT administration was postponed to the fall of the next school term. The result was that many of the sixth grade partially seeing students, upon being promoted to seventh grade, could not be located the next fall to take the SAT. Despite the most strenuous of efforts, too few of the students promoted to seventh grade could be found. Those who were found and tested could not reasonably be considered representative of the group who had been tested by the MAT in sixth grade in the preceding school term.

On the other hand, the fifth graders promoted to sixth grade were relatively easy to locate since they tended to stay in the same schools. Therefore, the analysis of SAT achievement and its correlates was confined to the sixth grade group shown in Table 3.

TABLE 3

STATE AND RESIDENCE, GRADE PLACEMENT AND SEX OF STANFORD ACHIEVEMENT TEST SAMPLE POPULATION

State of Residence	Pupils in Fifth Grade			Pupils in Sixth Grade			Pupils in Seventh Grade			Pupil Totals		
	M	F	T	M	F	T	M	F	T	M	F	T
California	0	1	1	10	8	18	5	9	14	15	18	33
Florida	0	0	0	2	2	4	0	0	0	2	2	4
Georgia	0	0	0	8	7	15	9	3	12	17	10	27
Illinois	1	0	1	13	12	25	16	12	28	30	24	54
Maryland	0	1	1	2	3	5	4	2	6	6	6	12
Massachusetts	2	0	2	1	2	3	5	1	6	8	3	11
Michigan	7	1	8	10	10	20	3	4	7	20	15	35
Missouri	1	0	1	7	2	9	5	3	8	13	5	18
New Jersey	0	0	0	3	3	6	4	3	8	7	6	13
New York	2	0	2	18	18	36	19	12	31	39	30	69
Ohio	5	8	13	23	15	38	9	7	16	37	30	67
Oregon	0	0	0	0	2	2	1	2	3	1	4	5
Pennsylvania	0	1	1	9	13	22	17	14	31	26	28	54
Texas	0	1	1	1	0	1	0	0	0	1	1	2
Wisconsin	1	0	1	4	6	10	5	4	9	10	10	20
TOTALS	19	13	32	111	103	214	102	76	178	232	192	424

Non-Handicapped Sample Population:

For purposes of comparison under untimed conditions the SAT was administered to a group of 293 fifth and 239 sixth grade students in regular elementary grades. The sample population was drawn from the elementary schools of Wilkinsburg, Pennsylvania. The scores on the SAT, timed and untimed for the group, are shown in Table 4.

TABLE 4

STANFORD ACHIEVEMENT TEST RESULTS FOR NON-HANDICAPPED SAMPLE POPULATION

SAT Subtests	Timed Raw Scores Fifth Grade N=293		Timed Raw Scores Sixth Grade N=239		Untimed Raw Scores Fifth Grade N=293		Untimed Raw Scores Sixth Grade N=239	
	M	S. D.	M	S. D.	M	S. D.	M	S. D.
Word Mean.	23.13	8.66	31.23	8.61	24.58	8.60	32.26	8.35
Para. Mean.	34.31	11.22	43.07	10.65	36.68	11.45	45.43	10.20
Spelling	27.82	10.45	38.31	10.34	28.37	10.53	38.97	10.23
Language	96.54	21.56	118.47	18.74	97.80	21.28	119.88	18.41
Arith. Comp.	14.65	4.73	20.77	6.23	14.98	4.77	21.16	6.13
Arith. Concepts	11.16	4.67	15.64	5.60	11.23	4.78	15.67	5.63
Arith. Applic.	16.08	7.05	22.36	7.20	16.25	7.05	22.54	7.23
Soc. Studies	40.62	10.66	51.01	9.08	40.88	10.58	51.18	9.11
Science	32.24	10.41	38.79	9.39	33.11	10.05	39.53	9.57
TOTALS	281.47	71.80	355.38	75.98	288.17	71.61	361.72	75.72

Representativeness of the Partially Seeing Sample Population:

It became apparent early that it would be impossible to assure obtaining a sample which could be called representative, for the characteristics of the universe of partially seeing children are not known. Some of the factors which forced that conclusion are noted below.

1. The nearest approximation of the total universe of partially seeing children receiving special education in the United States was found in a U. S. Office of Education report (Mackie, Williams and Robins, 1961) listing the school systems of the nation with educational programs for partially seeing children, along with the number of such children in elementary and secondary grades. When published, the list was at least three years old. The data had been collected from state departments of education, which had gathered the data from local school systems. There was no information about attrition which might have occurred between requests for data and responses between local school systems and state departments of education and between the latter and the U. S. Office of Education.

2. The data in the U. S. Office of Education report were collected five years prior to the conduct of the study here reported. Therefore, an unknown amount of change occurred in the population of classes for partially sighted children in the interim. The fact that changes can occur in significant degrees has been demonstrated (Kirk, 1965).

3. The number or location of partially seeing children in the United States, in or out of school, is not known. The available estimates admit to uncertainty (Ashcroft, 1963).

4. Various states use different criteria for defining who will be considered visually handicapped for educational purposes (Jones and Collins, 1966).

5. The wide range of differences among states between number of partially seeing children reported in special education programs in proportion to total state population suggests that in certain states there are significant numbers of partially seeing children who have not been identified and placed in special education programs. For example, the states of Virginia, Wisconsin and Georgia, each with a total population approximating four million persons, reported 85, 121 and 205 partially seeing children in elementary grades, respectively (Mackie, Williams and Robins, 1961). The characteristics of unidentified children might differ from the characteristics of those in special education programs.

The five items above do not constitute an exhaustive list of the factors which limit knowledge about the universe of partially seeing children in the United States. However, they are sufficient to indicate that there is not a well-defined universe. Therefore, it is not possible to be certain about representativeness of samples.

Instrumentation

Three major data collection instruments were employed in the investigation. These were a pupil data collection sheet, a measure of reading speed and comprehension and a measure of school achievement. The first was designed by the project staff with the assistance of consultants and the latter two were adapted from existing published standardized tests.

The Personal Pupil Data Sheet:

A form called the Personal Pupil Data Sheet was used to collect information about each fifth and sixth grade partially seeing student. The form is reproduced in full in Appendix B. In addition to identifying information such as age, name, and location, the form asked for data on the educational program in which the child was enrolled, intelligence, achievement in school subjects, nature and state of vision, other handicaps, and instructional aids. Teachers were encouraged to include other information, too, which might have significant effects on educational practices for each particular child.

All teachers in the sample originally selected for the study were sent Personal Pupil Data Sheets. Those pupils on whom responses were received made up the group in Table 1 called the Identifying Information Sample Population (IISP).

The Measure of Reading Speed and Comprehension:

The Metropolitan Achievement Test, Intermediate Battery - Partial for grades five and six (with two subtests omitted) was the measure of reading speed and comprehension. Referred to hereafter as the MAT, it contained subtests of:

	EACH FORM	
	No. Items	Time (Min.)
Word Knowledge	55	14
Reading (Para. Comp.)	44	25
Spelling	55	17
Language: Usage	35	13
Punct. & Capitalization	36	9
Parts of speech: grammar	10	4
Language Study Skills	28	16
TOTAL	263	100

The above constitutes a shortened version of the MAT, Intermediate Battery - Partial, leaving out tests of arithmetic and social studies skills. The test in the forms used could be administered in two sittings of 63 and 50 minutes, respectively, allowing time for distribution, reading directions and the like. The number of sittings could not be completely standardized, and teachers sometimes used more than two sittings.

Rather than limit the reading sample to the 39 minutes and 99 items in the first two subtests (usually thought of as comprising a "reading" test), the other subtests listed above were included. The result was a longer sample including more conditions similar to those under which children apply reading skills in their daily work in school. Also, the sittings were long enough to increase the possibility of the appearance of such factors as visual fatigue if, indeed, such factors are of significance. The reading sample took account, too, of the findings in prior research (Eakin, Pratt and McFarland, 1961) that suggested the use of longer reading periods.

The total raw score on each form was used as the measure. As reported by the publisher (Dorost, 1959, p. 2) "All the forms of the MAT of any given level are comparable as to difficulty and content, are equally good measures of the respective subjects, and yield comparable results." Thus, the measure was a group of reading tasks in five equivalent forms, each varying from the other in type-size. The wide variation in type size made it necessary that the test booklets vary in size from form to form. There is research evidence indicating that format changes on otherwise equivalent tests do not result in significant differences in scores (Lopez 1961). In respect to proportionate leading and kind of paper the forms were the same.

The use of total raw score on the MAT as the reading measure results in an average error of ± 1.3 percent in form-to-form equivalence of total scores. The publisher provides for the conversion of raw scores to standard scores to make the forms fully equivalent. The raw score measured were used, however, in establishing the type size employed in the succeeding step in the investigation before the small discrepancy was noted, and a change was not possible at that point. The result is a known and unsystematic error of ± 1.3 percent in the reading measure.

The Measure of School Achievement:

The Stanford Achievement Test, Form W, was used as a measure of school achievement. The test consists of the following parts.

Subtests	No. Items	Time (Min.)
Word Meaning	48	12
Paragraph Meaning	64	30
Spelling	56	15
Language	134	48
Arithmetic Computation	39	35
Arithmetic Concepts	32	20
Arithmetic Applications	39	32
Social Studies	74	50
Science	58	25
TOTALS	543	267

Counting time for directions and the like, the usual total time for administration is approximately five hours. It is recommended that the test be given in seven sittings.

For the purposes of this study the test was reprinted in five different type sizes, 12, 15, 18, 21 and 24 point. As in the case of the MAT, leading was kept proportionate and the paper was the same.

The directions were supplemented in order to allow the collection of additional data. These included records of the students' progress under timed and untimed conditions, records of the reading distances for individual pupils and records of the optic aids used when taking the test.

The SAT in 12 point type was used also for achievement testing of the non-handicapped sample. Data were collected under both timed and untimed conditions.

The Use of Untimed Scores on the SAT:

In determining the grade equivalents for the partially seeing children on the Stanford Achievement Test untimed scores were used. There is evidence that partially sighted children read more slowly than visually normal children (Nolan, 1959). The use of timed scores under that circumstance would have violated the principle upon which the Stanford Achievement Test standards are based, as indicated in the following quotation from the directions for administering the test (Kelly, Madden, Gardner and Rudman, 1964, p. 4).

"Although almost all tests are time limit tests, the time limits are provided as matters of administrative convenience rather than for the purpose of placing any premium upon speed of work. The time limits in all cases are generous and calculated to give practically all pupils sufficient time to attempt all questions which they are capable of answering correctly. The tests, therefore, are fundamentally power tests and not speed tests."

From the statement above, the untimed test scores for the partially seeing population should be more appropriate for comparison with the achievement test norms than would the timed scores.

Data Collection

General:

All pupil information data were provided by the teachers of the partially seeing children. The Personal Pupil Data Sheets were completed by teachers from school records on the children or from the teachers' own observations. The tests, too, were administered by the teachers; thus the records of optic aids, reading distance and related information were made by competent persons.

All instructions to teachers for data collection were either by mail or telephone, with correspondence by letter being used in the vast majority of instances. Each set of mailed instructions was pre-tested on teachers in local classes for the partially seeing before use. Teachers were encouraged to write to the project office to clarify any questions they might have.

The tests were administered under normal school conditions, the sittings spaced into the on-going instructional program. Teachers oriented their students to the purpose of the tests.

Appendices B through H are samples of information to teachers and various data collection forms used in the study when corresponding with school officials and teachers.

Administration of the Metropolitan Achievement Test:

A Latin square design was used in the administration of the MAT. The population was divided into five approximately equal groups, with equivalent forms of the test in five type sizes (12, 15, 18, 21, 24 point) being administered to the groups in alternate order, as illustrated in Table 5.

TABLE 5

DESIGN FOR ADMINISTRATION OF METROPOLITAN ACHIEVEMENT TEST

Testing Sequence by Type Sizes	Population Groups				
	1	2	3	4	5
First Wave	12 pt.	15 pt.	18 pt.	21 pt.	24 pt.
Second Wave	15 pt.	18 pt.	21 pt.	24 pt.	12 pt.
Third Wave	18 pt.	21 pt.	24 pt.	12 pt.	15 pt.
Fourth Wave	21 pt.	24 pt.	12 pt.	15 pt.	18 pt.
Fifth Wave	24 pt.	12 pt.	15 pt.	18 pt.	21 pt.

The design was intended to contribute to control through spread of the effects of (a) differences in test administration skill on the part of the teachers, (b) practice in taking tests, (c) possible effects of changes from one type-size to another, and (d) levels of motivation in students taking the tests.

The states or large cities included in each mailing wave and the dates of the mailings as planned are listed below. In some instances, to equalize the number of pupils in each wave, large cities in certain states were treated separately.

	Dates Planned for Mailing Waves				
	1/27	2/17	2/27	3/9	3/16
	1	2	3	4	5
	Test Forms*				
Baltimore	A	B	C	D	E
California	C	D	E	A	B
Chicago	E	A	B	C	D
Florida	D	E	A	B	C
Georgia	D	E	A	B	C
Illinois	D	E	A	B	C
Massachusetts	B	C	D	E	A
Missouri	C	D	E	A	B
New Jersey	D	E	A	B	C
New York	A	B	C	D	E
New York City	B	C	D	E	A
Ohio	E	A	B	C	D
Oregon	D	E	A	B	C
Pennsylvania	C	D	E	A	B
Wisconsin	D	E	A	B	C

* A=12 pt. type B=15 pt. type C=18 pt. type D=21 pt. type E=24 pt. type

Determination of Best Metropolitan Achievement Test Score:

Some of the forms of the MAT were administered as much as four months later than others to the same children because of the time lapse planned in the mailing waves and because of unplanned additional delays in individual instances. Therefore there was opportunity for the effects of on-going instruction to influence achievement on tests taken later in the sequence. To allow for that, a correction factor was calculated and applied to the obtained test scores to permit treating all the five MAT scores for each child as though they were obtained at the same time. The description of the calculation and application of the correction factor is found in Appendix I.

The corrected total raw scores were inspected to determine which of the five was highest. That score was designated the student's Best MAT score.* A summary of the Best MAT findings are shown in Appendix J.

The type-size of the MAT form on which a child earned his Best MAT score was designated the type-size most suitable for reading for that child. The criterion for determination of the most appropriate type size for each child was the highest corrected raw score on one of five MAT administrations.

Because attrition was a serious problem, a plan was developed to salvage as many subjects as possible from those who had not taken all five of the forms of the MAT. The test records of children who had taken four but not five of the MAT forms were inspected. In some cases it was found that the highest obtained score of the four had lower scores on each side of it. For example, a child may have taken the test in 15, 18, 21 and 24 point type, but not in 12 point type. And the 21 point type test form may have had the highest score, with the 15, 18 and 21 point scores all being lower, and the 15 point lower than the 18 point. In such an instance the subject was included in our Best MAT population, the choice of best type being the 21 point size.

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*In a few cases scores on two tests tied for highest. In those cases, the form printed in the smaller of the two type sizes was chosen as the Best MAT score.

Administration of the Stanford Achievement Test:

The Stanford Achievement Test (SAT) was mailed to teachers in the fall of 1965. Copies of Form W of the test were supplied in the type size appropriate for each child as determined from the MAT administration, and the children to take the test in each type size were specified.

Supplementary directions were pretested and sent to the teachers along with the tests. Space was provided on the test forms to record time for sittings, optic aids used, reading distance and other special information needed. The SAT was administered to students during the months of December, 1964 and January, 1965.

Test Scoring and Data Recording:

College students were employed and trained to score the tests, both the MAT and the SAT. Checks were made on accuracy of scoring.

The test scores and the material on Personal Pupil Data Sheets were transferred to master data sheets which were bound into books. The transfer work was done by clerical personnel and their work was checked for accuracy by the professional staff of the project.

Feed-Back to Teachers:

For both the MAT and the SAT, information was returned to local schools. As soon as test scoring was completed on any form of the MAT and on the SAT the results were recorded on individual student forms and mailed to the teachers who were participating in the study. A sample of the form is shown in Appendix C. In all instances teachers were supplied with copies of the tests and test manuals and with the necessary material for conversion of raw scores to standard scores and thence to grade equivalents. The tests were plainly marked as experimental editions. The teachers were informed about the type size on which each child had performed best.

Data Treatment

The data were keyed and card-punched. Usual verification procedures were used. The data were then analyzed by computers at the University of Pittsburgh Computer Center. The specific treatments employed are evident in the statements of results in the next chapter.

RESULTS

This section includes findings on the characteristics of partially seeing children and the tests of the hypotheses. The characteristics of partially seeing children will be presented first, under five topic headings: the educational setting, intelligence, vision, school achievement, and type-size. Then the tests of the hypotheses will be shown, followed by findings on reading distance, relationship of vision disabilities to other variables, and an approach to objective selection of type size.

The Educational Setting

Ages of the Children:

Partially seeing children in this sample are over-age for grade by one year and nine months if ten years is taken as the average age for children as of September first for the fifth grade and eleven years for the sixth grade. Table 6 shows the ages of 862 pupils in the Best MAT Sample Population, as of September 1, 1964, by grade and sex, the school year in which the MAT was administered. Data on age in months were not available on 41 of the 903 children in the sample population. Had all the 41 children on whom age data were missing been at the correct age for grade the average amount of over-ageness would have been reduced by only one month.

TABLE 6

AGE IN MONTHS AS OF SEPTEMBER 1, 1964* OF BEST MAT SUBJECTS BY GRADE AND SEX

Populations	Boys				Girls				Total			
	N	M	SD	R	N	M	SD	R	N	M	SD	R
Fifth Grade	246	141.7	9.9	119-172	178	140.4	9.5	122-172	424	141.2	13.8	119-172
Sixth Grade	248	153.8	9.4	128-176	190	152.4	8.7	134-175	438	153.2	12.9	128-176
TOTAL	494	147.8	13.6	119-176	368	146.6	13.0	122-175	862	147.3	18.8	119-176

* Data not available on 41 of the total of 903 subjects.

The difference between boys and girls in age-grade placement are insignificant. There is very little under-ageness for grade, and over-ageness ranges upward to four years and two months in fifth grade and to three years and eight months in sixth grade. While age data were not available in usable form on 4.5 percent of the Best MAT Sample Population, there was no reason to believe that the missing data would have made any appreciable difference in the findings reported in Table 6.

Children's Residences:

Table 7 shows where the partially sighted children in the Best MAT Sample Population were living at the time arrangements were made for their participation in the study.

TABLE 7

CHILDREN'S RESIDENCE WHEN PROJECT BEGAN

	No. of Children				TOTALS	Percent
	Fifth		Sixth			
	M	F	M	F		
Home of natural parents	224	166	234	178	802	88.8
One natural parent and other relatives	13	7	11	4	35	3.8
Relatives other than natural parent	8	6	9	10	33	3.6
Foster parents or boarding home	4	1	4	5	14	1.5
Home of parents by adoption	2	1	5	5	13	1.4
Children's,orphan's homes or residential schools	2	0	1	0	3	.3
Unknown	1	0	0	2	3	.3
TOTALS	254	181	264	204	903	99.7

Slightly more than nine out of ten partially seeing children live with natural or adoptive parents. Only 5.4 percent reside in settings without at least one natural parent present.

Home-School Relations:

The home-school cooperation as evaluated by the teachers of visually handicapped children is shown in Table 8 for the Best MAT Sample Population of 903 fifth and sixth graders.

TABLE 8

HOME-SCHOOL COOPERATIVE RELATIONSHIP

Degree of Cooperation With School	%	No. and % of Children				TOTAL	
		Fifth		Sixth			
		M	F	M	F	M	F
Home very cooperative	60.4	151	112	157	125	308	237
Home mildly cooperative	29.9	75	55	82	56	157	111
Home uncooperative	5.1	13	6	14	13	27	19
Unknown degree of cooperation	4.9	15	8	11	10	26	18
TOTALS	100.3	254	181	264	204	518	385

If "very cooperative" is given a value of one, "mildly" a value of two, and "uncooperative" a value of three, the overall mean is 1.5; thus the typical degree of cooperation of home with school is midway between mildly and very cooperative. There are no great differences in cooperativeness between the homes of boys and girls.

Types of Special Education Programs:

According to teacher reports, the 903 pupils in the Best MAT population were enrolled in 11 varieties of special education programs for partially seeing children. They were grouped for reporting into the six categories shown in Table 9. Parentheses show the additional terms used by teachers beyond those of the six categories to describe types of special education programs in terms of administrative arrangement.

TABLE 9

INCIDENCE OF SUBJECTS BY TYPE OF SPECIAL EDUCATION PROGRAM

Special Education Program	No. of Subjects in:				TOTAL
	Fifth Grade		Sixth Grade		
	M	F	M	F	
Special Class	125	70	112	89	396
Resource Room (plus regular class supplemented by special class; integrated program)	84	59	81	72	296
Itinerant (plus teacher-consultant)	31	45	60	33	169
Regular Class (plus with special material)	8	6	4	3	21
Residential School	5	1	4	5	15
Home Instruction (plus home-school telephone)	0	0	1	2	3
Not Given	1		2		3

It would not be advisable to take Table 9 as necessarily indicative of the actual distribution of partially seeing children among administrative arrangements across the nation. Attention is called to the remarks made earlier concerning the uncertainty about what constitutes a representative sample of partially seeing children, whether in special education programs or not. Another factor possibly disturbing the data in Table 9 is the increased ease of administering a lengthy sequence of tests when children are in resource rooms or special classes as against their being in itinerant programs. Comparison with the most recent information on this point (Jones and Collins, 1966) cannot be made because the Jones and Collins data are in terms of numbers of programs and teachers and ours are in terms of numbers of pupils.

Number of Years in Special Education:

Table 10 supplies information on the number of years the Best MAT population had been in special education programs, including the year during which the MAT was administered. "One year" means at least one year and less than two years. The remaining categories have similar interpretations.

TABLE 10

NUMBER OF YEARS IN SPECIAL EDUCATION: MAT SAMPLE POPULATION

Time in Years	No. of Subjects				TOTAL
	Fifth Grade		Sixth Grade		
	M	F	M	F	
Less Than One	15	12	4	4	35
One	20	9	15	12	56
Two	29	15	20	18	82
Three	40	43	43	31	157
Four	58	43	46	30	177
Five	64	39	51	44	198
Six	13	11	49	44	117
Seven	4	2	19	9	34
Eight	1	0	3	3	7
Nine	0	0	3	2	5
Ten	0	0	3	2	5
Information Not Given	10	7	8	5	30
TOTALS	254	181	264	204	903
Means	4.5	4.5	5.4	5.4	
S.D.'s	1.7	1.6	1.9	1.9	

Both fifth and sixth graders typically were placed in special education programs relatively early in their elementary school careers. Relating the mean number of years in special education (Table 10) to the mean ages of the subjects (Table 6) it can be shown that placement in a special education program took place, on the average, when pupils were between seven and seven and one-half years of age. Approximately nine out of ten of the children had been in special education programs two years or more, and approximately four out of five, three years or more at the time of the study.

Other Handicaps:

To determine the presence of handicaps other than visual ones, teachers were asked to indicate additional educationally significant handicaps among their students. Table 11 gives the results. There is overlap since some children were reported to have more than one other handicap. The data are given for both Best MAT (N=903) and SAT sixth grade (N=214) sample populations.

TABLE 11

OTHER HANDICAPS

Handicap	Best MAT Sample Pop. (N=903)				SAT Sixth Grade Sample Pop. (N=214)			
	M	F	Total	%	M	F	Total	%
Emotional	111	69	180	20.0	25	13	38	18.1
Social	64	45	109	12.2	13	8	21	9.3
Speech	66	34	100	11.3	15	8	23	11.2
Health	57	29	86	9.5	16	6	22	10.3
Intellectual	43	42	85	9.4	10	5	15	7.0
Hearing	20	14	34	3.9	7	2	9	4.2
Cosmetic	12	17	29	3.2	2	2	4	1.9
Orthopedic	16	12	28	3.1	6	5	11	5.1
Other	30	14	44	4.9	8	5	13	6.1
TOTALS	419	276	695		102	54	156	

Counting each of the 903 children in the Best MAT Sample Population as each having a vision handicap and adding the 695 other handicaps results in an approximate average of 1.77 educationally significant handicaps per child. The table is read as follows with regard to the percents: Out of 903 pupils, 20% of the 903 in the Best MAT Sample Population were judged by teachers to have emotional handicaps, 12.2% had social handicaps, and so on. The percents are not additive because of the overlap.

Attributes Causing Greatest Educational Problems:

Teachers were asked to indicate the educationally significant attributes of the children's visual conditions which caused the greatest educational problems. In a number of cases more than one attribute was noted. Table 12 shows the number of times each item occurred in the Best MAT Sample Population (N=903) and the proportion displaying each attribute.

TABLE 12

EDUCATIONALLY SIGNIFICANT ATTRIBUTES OF VISION PROBLEMS

Attribute	Children Showing Attribute	
	N	Percent (Base=903)
Fatigue	357	39.5
Rest periods required	185	20.5
Increase of normal light required	138	15.3
Cannot see complete words	129	14.3
Eye use restricted	112	12.4
Lack of distance vision - (blackboard, movies, cross streets, games)	112	12.4
Seat changes needed because of peripheral vision	109	12.1
Decrease of normal light required	59	6.2
Other	351	38.9

Teachers reported 1,552 instances of educationally significant attributes of visual conditions. There may be some overlap among "fatigue," "rest periods required," and "eye use restricted," since interpretations of the meaning could have been similar. However, each notation by a teacher was tabulated separately. Together they make up almost 43 percent of all the instances in which educationally significant attributes were reported.

Intelligence of Partially Seeing Children

The intelligence of partially seeing children has been a focus of interest and of speculation for many years. One reason for uncertainty about it is the failure to use measuring devices designed to give equated results for partially seeing children and non-visually handicapped children. Another reason is the absence of intelligence test data on a sample of partially seeing children which might be considered representative. For this investigation teachers were asked to supply what information they had on the tests used with their pupils and to report the ratings resulting from the tests.

Intelligence Tests Used:

A wide variety of intelligence tests, nineteen in all, were reported used in assessing intelligence of the subjects. The most recent tests used and their frequencies with the Best MAT Sample Population are shown in Table 13.

TABLE 13

INTELLIGENCE TESTS REPORTED USED

Test	Subjects N
Stanford Binet	321
Wechsler	141
Otis	80
California Mental Maturity	54
Kuhlman Anderson	51
Hayes Binet	36
Pintner Cunningham	24
Lorge Thorndike	23
Detroit Learning Aptitude	21
SRA Primary Mental Abilities	10
Henmon Nelson	5
Ammons Picture Vocabulary	4
Kent Emergency	4
Columbia Mental Maturity	2
Detroit Beginning 1st. Grade	2
Goodenough Draw-a-Man	1
Peabody Picture Vocabulary	1
Pintner Durost	1
Pintner Patterson	1
Not Reported	121
TOTAL	903

Intelligence of the Subjects:

The information reported in Table 14 comes from 18 different intelligence tests. The interpretation of such combined data from different tests is open to question, of course.

For the 792 subjects on whom intelligence quotients were reported by teachers, the mean was 95.83. There were 44 subjects with I.Q.'s 75 or lower.

It is speculated, in view of their known slower reading rate, that the intelligence of partially seeing children is underestimated when group tests are administered under standard time conditions. If that occurred in this sample the group should be considered at least of average intelligence.

TABLE 14

INTELLIGENCE OF BEST MAT SAMPLE (N=903) AND SAT SIXTH GRADE (N=214) SAMPLE POPULATION

	N*		Mean IQ		SD IQ		Range IQ	
	M	F	M	F	M	F	M	F
Best MAT (5th Grade)	220	162	95.7	96.0	12.6	15.0	62-129	61-131
Best MAT (6th Grade)	232	178	96.6	95.0	14.3	15.1	45-139	45-137
SAT (6th Grade)	96	98	95.4	96.8	12.0	16.0	70-129	45-131

* IQ's were not available for 111 MAT subjects and 20 SAT subjects.

The Vision of Partially Seeing Children

The consequences of vision defects as they effect the process and the substance of education form the rationale for special education for partially seeing children. Presumably the kind and degree of impairment bears some relationship to education, particularly when the disability cannot be corrected sufficiently to bring it into the normal range required for effective visual functioning in typical school tasks. Therefore teachers of partially seeing children need to know whatever educationally relevant facts can be determined about the vision of their pupils.

Visual Acuity Information Available:

Visual acuity has had a prominent role in definitions of the term "partially seeing." By historical definition partially seeing children have visual acuity between 20/70 and 20/200 and/or some other vision problem, thus justifying special education. It is a standard recommendation in teacher preparation programs that teachers have up-to-date facts on the near and far point visual acuity of all their partially seeing pupils. In order to learn what information teachers do have about visual acuity, the question was raised as to what measures of far and near point acuity were available in their records.

Table 15 shows the status of the records of the teachers regarding the visual acuity of the 903 fifth and sixth grade pupils in the Best MAT Sample population. In seven percent of the cases neither far nor near point visual acuity data were available to teachers. In only about two-fifths of the cases were both near and far point acuities reported.

TABLE 15

VISUAL ACUITY INFORMATION AVAILABLE TO TEACHERS

	Near Point Only		Far Point Only		Both Near and Far Point		Neither Available	
	N	%	N	%	N	%	N	%
Best MAT Population (N=903)	27	3.0	46	51.0	352	39.0	63	7.0

Visual Acuity of Partially Seeing Children:

Where the information was available reports were obtained from the teachers indicating the degree of visual acuity for their students in the better eye after correction, at both near and far point. Table 16 shows the distributions in the six categories in which the responses were grouped for analysis (see Appendix K). Both the results from the Best MAT Sample population and the SAT Sixth Grade Sample population are shown.

The MAT and SAT groups are quite similar in proportions in each category.

Certification of Visual Acuity:

Table 17 shows the distribution by professional specialization of persons who certified the visual acuity reports in the records of the teachers of partially sighted children. In a few cases the names of clinics were noted instead of a professional specialization. Since professional specialization could not be inferred from the clinic names they were grouped with the children for whom no data were given on this point. The data in Table 17 are from the Best MAT population (N=903).

It is evident that physicians predominate in the certification of visual acuity for special education purposes, with almost 29 out of 30 of the physicians being ophthalmologists.

TABLE 16

VISUAL ACUITY IN BETTER EYE AFTER CORRECTION

Visual Acuity Defect	NEAR POINT				FAR POINT			
	Best MAT Pop.		SAT 6th. Grade Pop.		Best MAT Pop.		SAT 6th. Grade Pop.	
	N	%*	N	%*	N	%*	N	%*
No Measurable Defect (Normal Acuity)	5	1.1	1	.9	12	1.4	3	1.5
Very Mild	66	14.5	15	13.8	51	6.1	11	5.6
Mild	134	29.4	34	31.2	176	21.2	37	18.9
Moderate	139	30.5	34	31.2	479	57.7	119	60.7
Severe	44	9.6	11	10.1	107	12.9	25	12.8
Unknown	535		129		78		19	
TOTALS	903	100	214	100	903	100	214	100

* Percent of known cases.

TABLE 17

PROFESSION CERTIFYING VISUAL ACUITY

Professional Specialist Certifying	Best MAT Subjects	
	N	%*
Physician (not ophthalmologist)	29	3.3
Ophthalmologist	780	89.8
Optometrist	54	6.2
Nurse	6	.7
Not Given	34	
TOTALS	903	100%

*% of those given (base=869)

Visual Field Information Available:

Reports on the visual fields of partially seeing pupils were very rare. There were too few of them to include in the data analysis. Teachers had been asked to include visual field data in all instances that it was available to them. The fact that only a very small number were reported suggests that visual field information is not included in teachers' records in the great majority of cases.

Types of Visual Disabilities:

There are a number of ways of describing types of visual disabilities. Two were chosen for presenting the visual disability data collected in this study.* First, in Table 18, the data are organized in the classification schema recommended by the National Society for the Prevention of Blindness (Hurlin, 1960). It uses a two-fold approach. The site of the disability in the eye provides one dimension of the classification and the type of disability within that site is the second dimension, thus its name: Site and Type Classification. Then, in Table 19, the Structural Classification of the Pennsylvania Association for the Blind is used to show the same visual disabilities in another frame of reference. The Structural Classification takes its name from the uni-dimensional approach to organization by reference to the particular part of the structure of the eye which is affected.

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* Special appreciation is expressed to Dr. Murray McCaslin, Chairman, Department of Ophthalmology, Medical School, University of Pittsburgh, for suggesting the classification methods used and for the laborious task of classifying the data reported.

Some partially seeing children have more than one kind of visual disability. Also, some kinds of disability may call for multiple classification in the Site and Type and in the Structural organizing schemes. Those factors account for the variation in the total N's of Tables 18 and 19 with respect to the N's of the samples of children.

Table 19 shows the distributions of visual disabilities reported by teachers for the Best MAT population and the SAT (6th Grade) population, arranged in the Structural Classification of the Pennsylvania Association for the Blind. Students with multiple visual disabilities are counted in one or more classifications, depending on structural location of the disabilities.

TABLE 18

VISION DISABILITIES BY SITE AND TYPE CLASSIFICATION

Disability Classification	Best MAT Sample Pop. (N=903)	Sixth Grade SAT Sample Pop. (N=214)
1. Myopia	307	67
2. Hyperopia	203	47
3. Juvenile Glaucoma	24	7
4. Albinism	56	21
5. Coloboma	15	1
6. Anophthalmus	6	1
7. Neurophthalmus	91	21
8. Aniridia	0	0
9. Other gen. affections of globe	5	1
10. Conjunctival	0	0
11. Cornea	13	1
12. Cataract and Aphakia	101	30
13. Dislocated lens	26	5
14. Vitreous, Iris and ciliary body	7	3
15. Retrolental Fibroplasia	118	27
16. Retinal-macular degeneration	52	9
17. Other retinal conditions	59	11
18. Optic nerve pathway cortico-visual center	4	2
19. Atrophy	62	15
20. Other nerve pathway conditions	9	1
21. Other specified affections	22	5
22. Motility	94	23
23. Nystagmus	1	0
TOTALS	1,275	295

TABLE 19

STRUCTURAL CLASSIFICATION OF VISUAL DISABILITIES

Structural Classification	N and Proportion of Subjects	
	Best MAT Pop. (N=903)	SAT (6th Gr.) Pop (N=214)
Cornea	13	1
Iris & Ciliary Body (Uveal Tract)	66	21
Lens	132	38
Vitreous	3	0
Retina and Choroid (Retinopathy)	286	61
Optic Nerve	72	17
Neuromuscular (Motility-phorias, Nystagmus-pathways)	364	82
Enucleation	11	3
Refractive Errors	472	101
Eyeball	29	11
TOTALS	1,447	335

Age of Onset:

The data in Table 20 indicate the ages at which the visual defects were reported as having their origin. "One year" means one year and less than two years, and the remaining are similarly interpreted.

It is noteworthy that more than 70 percent have their origin before the second birthday and that nearly four out of five disabilities occurred before the fourth birthday. Thus the great majority of defects are presented at the time children enter school.

State of Vision Disabilities:

Inquiry was made to determine whether the disability in each case was stable or progressive or if the status was unknown. Five other terms reported by teachers proved impossible to classify according to the intent of the query. The results are shown in Table 21 for the Best MAT Sample population and for the SAT (6th Grade) Sample population.

Most of the children's visual disabilities were stable according to teachers' records at the time of the investigation. Perhaps more significant is the finding that in slightly more than a third of the cases the teachers did not know whether the pupils' disabilities were progressive or stable.

TABLE 20

AGE OF ONSET OF VISION DISABILITY

Age	Best MAT Pop.		SAT (6th Gr.) Pop.	
	N	% *	N	% *
Congenital	398	60.3	100	65.4
One Year	75	11.4	12	7.8
Two Years	13	2.0	3	2.0
Three Years	9	1.4	1	.7
Four Years	14	2.1	6	3.9
Five Years	10	1.5	1	.7
Six Years	33	5.0	3	2.0
Seven Years	26	3.9	10	6.5
Eight Years	31	4.7	5	3.3
Nine Years	11	1.7	3	2.0
Ten Years	8	1.2	1	.7
Eleven Years	8	1.2	1	.7
Twelve Years	24	3.6	7	4.6
TOTAL	903	100	214	100

* Percent of known cases

TABLE 21

STATE OF DISABILITY

State	N Best MAT	N SAT (6th Grade)
Stable	429	98
Do not know	318	77
Progressive	138	35
Guarded	12	1
Fair	3	2
May improve to a point	1	0
Slight Improvement	1	0
Questionable	1	1
TOTAL	903	214

School Achievement of Partially Seeing Children

This section deals with the findings concerning the effects of extending time limits on achievement tests and the estimates which teachers supplied about the achievements of their pupils.

Effect of Extending Time Limits in Achievement Testing:

As was indicated earlier there is a rationale for extending time limits on the Stanford Achievement Test when it is used with partially seeing children. The rationale is based on evidence that partially seeing children read more slowly than children with normal vision and that the Stanford Achievement Test is a power test with liberal time limits.

During the administration of the Stanford Achievement Test the teachers indicated the points reached by their partially seeing students at the standard time limits. Then the students were allowed time to attempt additional items. The tests were scored for both timed and untimed conditions.

The same was done with a non-handicapped sample of fifth and sixth grade children. Thus it was possible to determine the effects of extending time limits for normal children, for partially seeing children, and to compare the two.

Table 22 shows the consequences in total raw score points of extending time for a normal fifth grade and a normal sixth grade group on the SAT and for the sixth grade SAT sample population of partially seeing children.

TABLE 22

EFFECT ON TOTAL RAW SCORE OF EXTENDING SAT TIME LIMITS

Sample Populations	N	Timed Score		Untimed Score		Mean Diff.	Significance Level
		M	SD	M	SD		
Normal 5th Grade	293	281.47	71.79	288.17	71.61	6.70	N. S.
Normal 6th Grade	239	355.58	75.98	361.72	75.72	6.34	N. S.
Partially Seeing 6th Grade	214	238.14	73.23	253.02	72.49	14.88	.01

For the normal fifth and sixth grades the mean differences, if spread across the nine SAT subtests, amount to approximately two-thirds of a raw score point on each, or approximately one month of achievement. For the partially seeing children, however, the average difference per subtest adds approximately three months of achievement to each. The partially seeing children do demonstrate their achievement more adequately under conditions which reduce time pressure.

Teachers' Estimates of Achievement:

Teachers estimated the achievement of their partially seeing pupils in the subjects commonly included in the elementary school curriculum. Table 25 shows the Means, S.D.'s and Ranges of the Best MAT Sample population (N=903) of those estimates in grades five and six.

The variation in N's from subject to subject reflects the extent to which teachers reported achievement estimates. The estimates were made at about mid-year. The most significant finding is the consistency with which teachers estimated their pupils' achievement at approximately one grade level below actual grade placement. Reading achievement was uniformly estimated to be lower than achievement in other subjects. The wide ranges of estimated achievement in reading and spelling are noteworthy.

TABLE 23

ACHIEVEMENT IN GRADE LEVELS ACCORDING TO TEACHERS' ESTIMATES

Subjects	Fifth Grade								Sixth Grade							
	N		M		SD		R		N		M		SD		R	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Reading	249	175	4.4	4.6	1.0	.8	1-9	3-8	250	199	5.4	5.4	1.2	1.1	2-9	2-9
Spelling	247	176	4.6	4.6	1.0	.8	2-9	2-8	248	201	5.4	5.6	1.1	1.0	1-9	1-9
Arithmetic	248	176	4.6	4.6	.8	.8	2-8	2-7	251	200	5.6	5.5	.9	.9	2-9	3-9
Science	231	169	4.7	4.6	.8	.8	3-8	3-8	242	190	5.5	5.5	1.0	.9	2-9	2-9
Social Studies	228	171	4.6	4.7	.7	.7	2-6	2-7	242	193	5.6	5.5	1.0	.8	2-9	2-9
Music	206	156	4.8	4.9	.5	.5	3-6	2-6	211	169	5.3	5.8	.6	.6	4-7	3-6
Art	198	155	4.8	4.8	.5	.6	2-6	2-6	207	166	5.8	5.7	.6	.7	3-8	3-6
Phys. Ed.	178	135	4.8	4.8	.5	.6	3-6	2-6	190	146	5.8	5.8	.6	.6	1-7	3-6
TOTALS			4.7	4.9			1-9	2-8			5.6	5.6			1-9	1-9

Type Size and Partially Seeing Children

As was indicated in the literature review, there are many questions about type size and the education of partially seeing children which have at best only incomplete answers. It was possible in this investigation to fill in some of the gaps in previous knowledge, as the following topics will illustrate.

Effect of Type Size on Ability of Students to Take the MAT:

Table 24 shows the number of students who took each form of the MAT. Since all partially seeing students in the Identifying Information Sample Population had equal opportunity to take the MAT in all five type sizes, any significant differences among the numbers who completing the tests in the different type sizes can be attributed to differences in ability to use the respective type sizes in the extensive reading required in taking the test.

The Chi Square in Table 24 is not significant at any level of confidence. It is evident, therefore, that size of type was not a significant deterant in taking the tests. Rather, the differences in numbers of children taking the test in the different type sizes is attributable to chance.

TABLE 24

STUDENTS COMPLETING THE MAT IN DIFFERENT TYPE SIZES

MAT Type Size	12	15	18	21	24	TOTAL OF TESTS TAKEN
No. of Students	937	957	977	952	944	4,767
Proportion of Students	.198	.202	.203	.199	.198	1.00
χ^2 Test of Significance of Difference in Proportions						0.98

Effect of Type Size on MAT Scores:

There were 814 subjects who took all five forms of the MAT. Table 25 shows the number who earned their best MAT scores on each of the type sizes, the percent of the 814 earning their best MAT scores on each type size, and the means and standard deviations of best MAT scores for each type size.

TABLE 25

COMPARISONS OF BEST MAT SCORES BY TYPE SIZE

Size of Type	12	15	18	21	24
N's	158	176	127	175	178
Percent of N's	19.4	21.6	15.6	21.5	21.9
M of Best MAT	160.49	160.66	147.79	150.28	146.34
SD of Best MAT	46.48	44.93	45.70	43.04	37.35

A test for the significance of differences among the percentages in Table 25 yields a Chi Square of 11.42, significant at the .05 level of confidence. The difference is probably attributable to the relatively smaller percent of subjects earning Best MAT scores on the MAT in 18 point type.

Approximately four out of ten (43.4 percent) partially seeing children seem to need rather large type (21 and 24 point) in order to read most effectively. Another four out of ten (41.0 percent) can read much smaller type sizes (12 and 15 point) best. Neither of the two groups (eight out of ten or 84.4 percent) is best suited by 18 point type. The most general finding seems to be that no one of the type sizes used can be considered superior to others with respect to optimum accommodation of partially seeing children in performing school-like reading tasks.

Visual Aids Used Under Best Type Size Conditions:

Reading under best type size conditions was defined for purposes of this investigation as the process of taking the SAT in the type size found best on the MAT, with freedom to use visual aids as desired and with freedom to employ any reading distance desired. Teachers observed their pupils and noted the visual aids they used, and the results of those observations are shown in Table 26, by type size.

TABLE 26

VISUAL AIDS USED UNDER BEST TYPE SIZE CONDITIONS (Sixth Gr. SAT)

Aids Used	N by Type Size				
	12	15	18	21	24
Glasses	21	21	14	20	20
Magnifier			1	1	
Finger and pointer	1				1
Low vision lens	1				
Telescopic lens		1			

Of the 214 children in the sixth grade SAT sample population teachers reported only 102 using visual aids during taking the SAT. Almost all of those were glasses.

Tests of Hypotheses

Four hypotheses were selected for testing before the investigation was initiated and one was added. The five hypotheses deal with relationships among achievement, reading skill, type size, visual acuity, reading distance and vision disability. The hypotheses are examined in order in the following sections.

Hypothesis 1. - Reading speed and comprehension of partially seeing children is positively related to size of type:

The hypothesis was tested in two ways, a correlation between Best MAT scores and the type sizes on which they were earned, and a correlation between SAT scores (of sixth graders) and the type sizes on which they were earned. The hypothesis was to be accepted if there were significant, positive correlations between size of type and size of test score. Table 27 summarizes the findings.

TABLE 27

CORRELATIONS BETWEEN TEST SCORES AND TYPE SIZES

Correlations Between Type Size and:	N	r	Significance Levels
Best MAT scores (5th Gr.)	435	-.088	> .05
Best MAT scores (6th Gr.)	468	-.158	> .05
Best MAT scores (Total)	903	-.128	> .05
SAT scores (6th Gr.)	214	-.135	> .05

The hypothesis is not accepted. All the correlations are low, have negative signs, and none is significant at the five percent level of confidence. From these results it can be concluded that there is no general relationship between reading speed and comprehension and type size among partially seeing children in the sense that larger or smaller type sizes are accompanied by higher or lower achievement test scores.

The mean type size for the SAT (6th grade) was 18.24, with S. D. 429.

Hypothesis 2. - Reading speed and comprehension of partially seeing children is inversely related to severity of visual disability:

This hypothesis could not be tested because information on severity of disabilities was not available in terms other than degree of visual acuity, which relationship to reading speed and comprehension was examined in another hypothesis. No medical reference was found which ranked types or kinds of visual disability in an order of severity. If severity of visual disability is thought of in terms of visual acuity (i.e. the lower the visual acuity the more severe the disability) this hypothesis could be considered the equivalent of Hypothesis 3., which follows.

Hypothesis 3. - Reading speed and comprehension of partially seeing children is negatively related to decrease in visual acuity:

The question was to determine if better (less defective) visual acuity is accompanied by better (higher) achievement on the MAT. Two correlations were required with the Best MAT score, one with far point and one with near point visual acuity. The hypothesis was to be accepted if there were positive significant correlations. Table 28 summarizes the findings.

TABLE 28

CORRELATIONS BETWEEN BEST MAT SCORES AND VISUAL ACUITY

Correlations Between Best MAT Score and:	N	r	Significance Level
Far Point Visual Acuity	830	-.045	> .05
Near Point Visual Acuity	456	-.093	> .05

The hypothesis is not accepted. The correlations are low, have negative signs, and neither is significant at the five percent level of confidence. These results lead to the conclusion that reading speed and comprehension and visual acuity are not related in partially seeing children.

Hypothesis 4. - The academic achievement of partially seeing children is equivalent to the achievement of non-handicapped children under power test conditions.

As indicated in the literature review there is little information on the school achievement of partially seeing children and its comparison with that of children in general. In order to make the comparison the results of the SAT on partially seeing sixth grade children (N=214) were studied in relation to the expected results on children in general. The means and standard deviations in Table 29 for partially seeing children were calculated from the sixth grade SAT data by subtests. The expected normal sixth grade mean scores were obtained from the test standards, using the grade expectancy of 6.4 to accommodate to the time of year the SAT was administered. The standard deviations for the subtests for the normal group were those found in the non-handicapped Wilkinsburg sample, since the SAT manual did not provide standard deviations for subtests on its normative group.

The differences in Table 29 are consistently in favor of non-handicapped children. The hypothesis of equivalence must be rejected. Under the most favorable conditions, with the most appropriate type-size, with freedom to use visual aids as required, and with relaxed time limits partially seeing sixth grade children earn achievement test scores whose median is one full grade below the expected achievement for sixth grade children in general. The highest performance of the partially seeing sixth graders is in arithmetic computation, concepts and application and the lowest performance is in science.

TABLE 29

COMPARISON OF ACHIEVEMENT OF PARTIALLY SEEING AND NORMAL SIXTH GRADE

SAT Subtests	Partially Seeing 6th Grade (N=214)		Expected Normal Sixth Grade Scores		Difference in Grade Equivalents
	Raw Score Mean	Grade Equiv.	Raw Score Mean	Grade Equiv.	
Word Mean.	21.80	5.5	28.00	6.4	.9
Para. Mean.	29.86	5.4	38.00	6.4	1.0
Spelling	25.73	5.4	33.00	6.4	1.0
Language	73.93	5.0	88.00	6.4	1.4
Arith. Comp.	17.02	5.7	20.50	6.4	.7
Arith. Concepts	11.69	5.6	15.50	6.4	.8
Arith. Applic.	16.08	5.6	20.50	6.4	.8
Soc. Studies	33.29	5.0	44.00	6.4	1.4
Science	26.20	4.9	35.00	6.4	1.5
TOTALS	253.02*		322.50*		
MEDIANS		5.4		6.4	1.0

* The difference between means for the two totals is significant at greater than the one percent level of confidence.

Hypothesis 5. - Type size, achievement and reading distance are positively related among partially seeing children.

Since the hypothesis regarding reading speed and comprehension and severity of visual disability (Hypothesis 3) could not be tested, another was formulated. It was postulated that there are significant positive relationships among type size, achievement and reading distance. That possibility was of considerable interest to special educators of the partially seeing, as indicated by comments made by members of the project's Advisory Committee. Further, there was no information in the research literature on reading distance used by partially seeing children or on the extent to which type size, reading distance and achievement might be related to each other.

The hypothesis was tested by computing correlations among the three variables, using the SAT sixth grade sample population. The results are shown in Table 30. The hypothesis is rejected, since two of the correlations, those between type size and achievement and reading distance and achievement are not significant.

The correlation of .166 between type size and reading distance is barely significant at the five percent level of confidence (an r of .164 is required). Inspection of the mean reading distances in Table 30 in relation to type sizes shows the magnitude of the relationship in practical terms. In short, knowledge either of a child's preferred reading distance, his achievement or his best type size tells little about any of the others.

TABLE 30

READING DISTANCE, TYPE SIZE AND ACHIEVEMENT (SAT 6th GRADE)

Type Size	N	Reading Distance (inches)		Achievement	
		M	SD	M	SD
12	38	5.92	2.41	250.95	54.43
15	40	6.75	2.83	239.71	62.70
18	35	6.77	2.81	254.23	55.35
21	41	6.17	2.70	263.67	70.00
24	43	6.63	3.09	257.43	59.48
TOTALS	197	6.45	2.77		

Correlations:	N	r's	Significance
Type Size and reading distance	199	r= .166	.05
Type Size and Achievement	214	r= -.135	N.S.
Reading distance and achievement	197	r= .033	N.S.

Reading Distance

Records were kept of the reading distances employed. Teachers were asked to estimate and record to the nearest inch the distance from eyes to printed page at the beginning, mid-point and end of each test. Using those data the mean, standard deviation and range was calculated for each child for each test.

Table 30 shows the mean and standard deviation for the average reading distances for the 197 sixth grade children who took the SAT and for whom reading distance data were available. The table shows, by type size, the reading distances and the means and standard deviations of SAT total raw scores for the same children.

The mean reading distance differences are not large, .85 inches separating the least from the greatest. The variation is similar in each instance.

Under the most favorable type size conditions and with free opportunity to use visual aids, the typical partially seeing child uses a reading distance of approximately 6.5 inches as opposed to the 14 inches considered appropriate for children in general.

Relationships of Structurally Classified Disabilities and Selected Educational Variables

A general question of interest to educators is the extent to which medical information about vision has educational relevance. Jones and Collins (1966, p. 34 and 36), for example, make the point that the special teacher, "...is coming to be responsible for meeting primarily only those instructional needs of visually handicapped children which are caused or emphasized by their ocular disabilities." In comments on teacher preparation they say: "More sophisticated case selection procedures, based on the educational effects of each child's eye condition rather than on the type or extent of visual loss, call for a greater understanding by today's teacher of the educational implications of the various types and degrees of visual limitations."

A beginning study of the question of the educational relevance of degrees of visual limitations as they might be reflected in visual acuity measures has been described earlier in this report. This section deals with the possible educational relevance of types of visual limitations.

There are a number of ways in which types of visual limitations might be grouped for analysis. Two of these, the Site and Type Classification and the Structural Classification have been noted earlier, and the disabilities of the sample populations were classified by both schemes.

It was decided to examine the simpler of the ways of classifying visual limitations, the Structural Classification, for possible relationships to educational variables of importance in this investigation. Therefore achievement, use of visual aids, reading distance, visual acuity and type size were analyzed to determine if they bore any significant relationships to types of visual disabilities when the disabilities were grouped according to the part of the anatomical structure affected.

It should be pointed out that this section of the report is concerned with an initial exploration of the topic. In the absence of any clear evidence from the research literature as to what might be the educational implications of the various types of visual limitations, an initial exploration, using the simplest classification available, seemed most appropriate.

Relationships with Achievement:

The ten categories of the Structural Classification were compared, one by one, with the SAT scores of the sixth grade sample population. No correlations significant at the five percent level of confidence were found.

The same was done with the estimates of pupil achievement furnished by the teachers on the same population. The results are shown in Table 31. Seven correlations were found to be significant at the five percent level or more.

TABLE 31

CORRELATIONS FOR SAT 6th. GRADE SAMPLE (N=214) ON TEACHER ESTIMATES OF ACHIEVEMENT AND STRUCTURAL ETIOLOGICAL CLASSIFICATION

Correlations Between:	Reading	Spelling	Arith.	Science	Soc. Stud.	Music	Art	Phy. Ed.
Cornea	-.02	.02	.03	.03	.03	.03	.07	.04
Iris & Ciliary Body (uveal tract)	-.20*	-.16**	-.18*	-.14**	-.12	-.10	-.05	-.14**
Lens	.00	.07	.03	.09	.09	.13	.04	.00
Vitreous	.00	.00	.00	.00	.00	.00	.00	.00
Retina and Choroid (Retinopathy)	-.08	-.10	-.06	-.05	-.01	.00	.01	-.06
Optic nerve	-.06	-.04	-.05	-.02	.00	.05	-.02	.07
Neuromuscular	-.09	-.02	-.14**	-.06	-.06	-.08	-.07	-.03
Enucleation	-.11	-.12	-.12	-.09	-.09	-.05	-.03	-.03
Refractive Errors	.11	.08	.16**	.04	.05	-.07	-.05	-.04
Eyeball	-.04	-.05	.00	-.04	-.03	.06	-.03	.00

* .01 confidence level
** .05 confidence level

The presence of seven significant but low order correlations among 80 correlations on the same population needs cautious interpretation. That is especially true when five of the correlations are significant at the five percent level of confidence and not at the one percent level. However, it may be more than a chance occurrence that five of the significant correlations appear between etiologies involving the iris and ciliary body (uveal tract) and teacher estimates of school achievement in various school subjects. It may be important to note, also, that all of the significant correlations are negative in sign and that the remaining correlations in the same line, while not large enough to be significant, are all negative in sign.

The kinds of visual disabilities which are classed in the iris and ciliary body (uveal tract) structural group include albinism, chronic aveitis, coloboma of iris and retina, congenital aniridia, cyclitis, and ophthalmia. The single largest group placed in the classification from the sixth grade population were albinos, of which there were 21.

Relationships With Use of Visual Aids:

Can teachers anticipate that pupils with vision disabilities in certain structurally classified etiologies will commonly use visual aids? If so, the structural classification used by physicians may convey useful information to special educators. The data in Table 32 provide information on the question.

TABLE 32

STRUCTURALLY CLASSIFIED ETIOLOGIES CORRELATED WITH USE OF VISUAL AIDS IN THE 6th GRADE SAT SAMPLE POPULATION N=214

Correlations Between Use of Visual Aids and:	r's
Cornea	-.037
Iris and Ciliary Body (uveal tract)	-.108
Lens	.056
Vitreous	.000
Retina and choroid	.141*
Optic nerve	.043
Neuromuscular	.005
Enucleation	.078
Refractive Errors	-.091
Eyeball	.026

* .05 level of confidence

With the exception of a slight positive tendency for pupils with structural etiologies of the retina and choroid to use visual aids more often than not, there are no significant relationships among structural etiologies and the use or non-use of visual aids in reading in school.

Relationships with Reading Distance:

To what extent is the preferred reading distance for school work a matter which can be inferred from knowledge of the type of visual disability? When disabilities are classified by anatomical location Table 33 shows what can be expected.

TABLE 33

CORRELATIONS OF STRUCTURALLY CLASSIFIED ETIOLOGIES WITH READING DISTANCE IN THE SAT 6th. GRADE SAMPLE POPULATION N=214

Correlations Between Reading Distance and:	r's
Cornea	-.049
Iris and Ciliary Body (uveal tract)	.115
Lens	-.127
Vitreous	.000
Retina and Choroid	-.093
Optic Nerve	-.046
Neuromuscular	-.016
Enucleation	-.085
Refractive Errors	.117
Eyeball	-.111

None of the correlations is significant at the five percent level of confidence. The general finding is one of no relationship between structurally classified etiologies and reading distance.

Relationship with Visual Acuity:

Visual acuity has long been considered one of the important components of definitions of visual handicap for educational purposes. While that role for visual acuity is being challenged and modified, it still plays a part in many state and local regulations. It could be helpful, therefore, to find if visual acuity, far or near point, is related to structurally classified disabilities.

TABLE 34

CORRELATIONS OF STRUCTURALLY CLASSIFIED ETIOLOGIES WITH VISUAL ACUITY IN THE SAT 6th. GRADE SAMPLE POPULATION N=214

Correlations Between Near Point V. A. and:		Correlations Between Far Point V. A. and:
Cornea	-.057	-.164**
Iris and Ciliary Body (uveal tract)	-.072	-.061
Lens	.208*	.000
Vitreous	.000	.000
Retina and Choroid (Retinopathy)	-.021	.108
Optic Nerve	-.041	.036
Neuromuscular	.060	.020
Enucleation	.123	-.032
Refractive Errors	-.011	-.074
Eyeball	-.004	.040

Confidence levels: * .01
** .05

From Table 34 it can be seen that there is a little tendency for etiologies of the lens to be associated with better near point visual acuity and for etiologies located in the cornea to be associated with poorer far point visual acuity. While each relationship is significant, neither is strong enough on its own to account for much visual acuity variance. The more general finding is that there is very little significant relationship between etiologies in structural terms and either near or far point visual acuity.

Relationships with Type Size:

Are there implications for the size of type to be used by children which can be derived from knowledge of the anatomical structural location of the visual disabilities? Table 35 shows the relationship which can be expected in that connection.

TABLE 35

CORRELATIONS OF STRUCTURAL ETIOLOGIES WITH TYPE SIZES AMONG SAT 6th. GRADE SAMPLE POPULATION N=214

Correlation Between Size of Type and:	r's
Cornea	-.100
Iris and Ciliary Body (uveal tract)	-.028
Lens	-.050
Vitreous	.000
Retina and Choroid (Retinopathy)	-.113
Optic Nerve	-.167**
Neuromuscular	.073
Enucleation	.022
Refractive errors	-.010
Eyeball	-.027

Confidence levels: * .01
** .05

The only significant relationship found regarding vision disabilities and type size is with vision disabilities whose etiology involves the optic nerve. In such cases there appears to be a significant but very modest tendency for smaller type size to be more suitable for the children in reading and related school tasks. The finding which is of more general importance is that the etiology in structural terms alone is of little value to the teacher with reference to prescribing size of type for school reading.

Summary of Relationships:

Generally speaking the results of exploring visual disabilities in a structural classification for relationships with achievement, use of visual aids, reading distance, visual acuity and type size are not promising. There are a few hints of possible relationships. It seems unlikely, however, that the structural classification itself has any particular merit as an organizational device for further study in a search for the educational implications of _types_ of visual limitations.

Objective Determination of Most Suitable Type Size

When a visually impaired child is being considered for a special education program he is often given a trial with ink printed instructional material to help determine whether ink print or braille should be used as his major mode of reading. Even when the evidence seems reasonably clear that ink print should be used there is still the question of whether the child would be better served by one type size or another. Trial and error is the chief approach in such cases, since the teacher has little other evidence on which to make a more systematic appraisal of the situation.

Regression Equation Approach:

A regression equation approach was taken to determine if teachers could be supplied with a more certain basis than trial and error for determining the most appropriate type size for a pupil to use in reading. If there are factors which have some bearing on whether one or another type size is most suitable for a particular child, presumably the factors can be identified and measured in some way. Also, it may be presumed that the presence or the degree of presence of the factors may vary from child to child. With those conditions in mind, and with a large group of partially seeing children for whom a preferred type size has been determined, it should be possible to determine how various factors possibly having a bearing on type size choice might be put together into a formula, the solution of which would be a prediction of the most suitable type size for the particular child.

A test of that approach was made. The Best SAT sixth grade sample population was used. The type size on which the Best MAT score was obtained was the criterion to be predicted. Eight areas of information (see Table 36) making up a total of 33 variables were included.

Findings from Regression Equation:

The highest Multiple R which could be obtained with the sixth grade sample was .43, with a standard error of estimate of 4.17. Thirty-one of the variables were used. The R was significant at the one percent level of confidence.

TABLE 36

VARIABLES IN REGRESSION EQUATION TO PREDICT TYPE SIZE

Information About Child	Number of Variables
Sex	1
Teacher's Estimate of Achievement	8 (grade levels in subjects)
Visual Acuity	2 (far and near point ratings)
SAT Score	1 (mean of all sub-tests)
Use of Visual Aids	1 (use or non-use)
Reading Distance	1 (mean in inches)
Structural Class of Disability	10 (presence or absence of 10 classes of disability)
Non-visual Educational Handicaps	9 (presence or absence of 9 handicaps)

An R almost as large can be obtained using far fewer than 31 variables in the regression equation. In Table 37 is shown the number of variables required to produce increases of at least two points in the Multiple R, beginning with the one variable which originally contributed the greatest.

TABLE 37

INCREASES IN MULTIPLE R BY ADDING VARIABLES

NUMBER OF VARIABLES	MULTIPLE R	STANDARD ERROR OF EST.
1	.17	4.23
2	.22	4.19
3	.25	4.17
4	.28	4.14
5	.30	4.12
6	.33	4.10
7	.35	4.08
9	.37	4.05
11	.39	4.04
13	.40	4.04
15	.42	4.03

The findings indicate that it is possible to improve the selection of the type size most appropriate for reading for an individual partially seeing child at the 6th grade level by using educational, psychological and medical data which might be available to teachers. A relatively small number of variables properly weighted and applied in a prediction formula could materially increase the precision of the initial selection by the teacher of type size for instructional materials.

It is important to point out that the above findings should be considered significant chiefly in that they demonstrate the potentiality of a regression equation approach to establishing an objective basis for the selection of the most appropriate type size for a given child. The actual equation developed is not of immediate use. It applies only to the sixth grade children used in this investigation and it utilizes variables on which measures were made for a variety of other purposes in addition to this purpose. Most important, any regression equation should be cross-validated before being applied in actual prediction. However, the results of this exploration are positive and do suggest that investigations aimed deliberately at predictions such as this might prove fruitful.

The original data, the calculations, the r's, weights and other factors involved in the development of the regression equation are on file with the principal investigator at the University of Pittsburgh. That material will be made available on request to investigators who may wish to study it in detail or use it in further research. It is considered part of the Data Bank which is referred to later in this report.

CONCLUSIONS

The following conclusions are drawn from the literature reviewed and from the results of data analysis on the sample populations used in this study. To the extent that the sample populations are representative of partially seeing children in the United States and to the extent that the limitations of procedure and research methodology employed allow, they are presented as generalizations. Unless otherwise stated they apply to partially seeing children.

1. Boys outnumber girls in special education programs, the ratio being 58 to 42.
2. Fifth and sixth grade pupils are typically over-age for grade by one year and nine months. Boys and girls are not significantly different in over-ageness.
3. More than 90 percent of partially seeing children live with their natural or adoptive parents.
4. Home-school relationships are typically cooperative.
5. Pupils are distributed among types of special education programs as follows:

Special Class Programs	43.9 percent
Resource Programs	32.8 percent
Itinerant Programs	18.7 percent
Other	4.6 percent

6. The average sixth grader has been in a special education program for 5.4 years of the 7.9 years he has been in school.
7. Other handicaps in addition to visual handicaps occur frequently.

8. The attributes of vision handicaps which teachers most frequently considered educationally significant are fatigue, the need for rest periods and restriction in eye use.
9. A little more than half of partially seeing pupils have records of intelligence evaluations in which individual tests were used. A wide variety of tests, group and individual are employed in assessment of intelligence of partially seeing children. In 12.3 percent of the instances teachers apparently have no intelligence test information on their pupils.
10. The typical partially seeing pupil is of at least average intelligence.
11. Teachers have both near and far point visual acuity findings on fewer than four out of ten of their children. For one out of fourteen pupils teachers have neither far nor near point visual acuity information, according to their reports.
12. Far point visual acuity fall within the 20/70 to 20/200 range for 57.7 percent of pupils. Better than 20/70 acuity is found in 28.7 percent and poorer than 20/200 in 12.9 percent.
13. Physicians certify the visual acuity information teachers have about their pupils in 93.1 percent of the instances, with almost 28 out of 30 of the physicians being ophthalmologists.
14. In very few instances do teachers appear to have data on the visual fields of their pupils.

15. A little more than half of the vision disabilities of partially seeing children are accounted for by myopia, hyperopia, cataract and aphakia, and retrolental fibroplasia, with myopia and hyperopia accounting for 40 percent of the total when the Site and Type Classification is used.
16. In the Structural Classification 87.1 percent of visual disabilities are found to be in the following four groups: refractive errors, neuromuscular, retina and choroid, and lens.
17. More than 70 percent of partially seeing children acquire their visual disabilities before the second birthday and almost four out of five before the fourth birthday.
18. More than one-third (35.2 percent) of teachers of partially seeing reported that they did not know whether the vision disabilities of their students were stable or progressive.
19. On the Stanford Achievement Test no significant increases in scores result when normal fifth and sixth grade students are permitted to work beyond the standard time limits.
20. Partially seeing students perform at significantly higher levels if standard time limits are relaxed when they are taking a standardized achievement test.

21. Teachers of the partially seeing consistently estimate their students' achievement to be one grade level below actual grade placement.
22. While partially seeing children generally are able to read in type ranging from 12 to 24 point sizes, there are individual differences among the type sizes on which their reading performances are best. Approximately the same proportions (21.6, 21.5, 21.9 percent) earn their best scores on 15, 21 and 24 point type, respectively. A slightly smaller percent (19.4) do best on 12 point type, and a substantially smaller percent (15.6) on 18 point type. No one type size can be considered to accommodate partially seeing children better than any others.
23. Though there is a relationship for the individual visually handicapped child between the type size he uses and his reading performance, there is no relationship for the group in the sense that larger or smaller type sizes are accompanied by higher or lower achievement test scores.
24. Reading speed and comprehension and degree of visual acuity are not related among partially seeing children.
25. The academic achievement of partially seeing children is not equivalent to that of non-handicapped children. It is significantly lower. On the basis of grade-to-grade comparisons, without considering overageness, partially seeing children are one full

grade level retarded academically. When the retarded age-grade status of partially seeing children is added into the account, they are approximately two and one-half years retarded academically by the time they are in sixth grade.

26. There is no relationship between best type size and achievement scores with partially seeing children in the sense that children typically using larger or smaller type sizes typically earn higher or lower achievement test scores.
27. There is no relationship between reading distance typically used and achievement scores with partially seeing children.
28. Best type size and typical reading distance employed are related to a very modest degree, larger type sizes being associated with slightly greater reading distances.
29. The average reading distance used by partially seeing children is 6.45 inches, with a standard deviation of 2.77 inches. Less than one percent of partially seeing children typically use the "normal" reading distance of 14 inches.
30. With possibly one exception, there are no relationships between pupils' achievement and their visual disabilities when the disabilities are categorized in the Structural Classification. The possible exception is very modest tendency for lower achievement to be associated with the iris and ciliary body (uveal tract) category.

31. The extent of use of visual aids bears no relationship to type of visual disability when disabilities are grouped according to the Structural Classification, with the exception that there is a very slight tendency for increased use of visual aids to accompany disabilities in the retina and choroid class.
32. There are no relationships between structurally classified visual disabilities and reading distance typically used.
33. With two exceptions there are no relationships between the near or far point visual acuities of partially seeing children and their visual disabilities when the latter are organized into the Structural Classification. One exception is a slight tendency for better near point acuity to be associated with disabilities structurally in the lens. The second is a very slight tendency for poorer far point acuity to be associated with the cornea group.
34. No structurally classified visual disability groups are associated with size of type except those in the optic nerve category, where there is a very slight tendency for smaller type sizes to be used.
35. A regression equation approach to the prediction of the most suitable type size for a given child with the factors in the equation being a number of educational and medical characteristics of the child, shows promise of providing an objective basis for the teacher to use in deciding the degree of type enlargement to use for instructional materials.

36. The most serious educational problem demonstrated by partially seeing children is severe educational retardation with respect to capacity for achievement. This condition appears not to be related in any substantial way to types of visual disabilities categorized by a structural classification or to degree of visual acuity.

THE TYPICAL PARTIALLY SEEING CHILD

To the extent that our data are from a representative population it is possible to use the results and conclusions in sketching a composite portrait of a typical partially seeing student in the sixth grade in the United States. Because our data focus on education the picture emphasizes features of most interest to teachers.

The youngster portrayed, whether boy or girl, is 12 years and 9 months old as of September 1 of the current school year and in sixth grade. Compared to 6th graders in general the partially seeing child is one year and nine months overage for grade. He lives at home with his natural parents. The family can be counted upon to be cooperative with the school, with the degree of cooperation ranging from mild to strong.

At school he is in a special class with a teacher of the visually handicapped. If he were not in a special class his next most likely placement would be in a resource type program. He has been enrolled in a special education program for almost 5 1/2 years, since he was just past seven years old.

In the view of his teacher the most significant educational attribute of his vision disability is fatigue. His vision defect, as certified by an ophthalmologist, is a refractive error, myopia, and his far point visual acuity is between 20/70 and 20/200. The disability is congenital and it has stabilized. His teacher has no information about his visual fields or his near point visual acuity, though if she did she would find that the latter is somewhat superior to his far point acuity. He has no other educationally significant handicap, but if he did it would most likely be what the teacher would judge to be an emotional problem.

He can read any type size in the 12 to 24 point range though not with equal ease. While he will be able to read more efficiently and effectively in one type size it is likely to be different from the type size most satisfactory for four out of five of his classmates. There will be no relationship between the type size he finds most satisfactory and his far point visual acuity. Whatever type size he uses with most success, he will use a reading distance of 6.5 inches and he will not use a visual aid in reading other than his regular correction.

He does better in school work involving reading if he is given extra time to complete it. His teacher rates his overall achievement at grade 5.6, with his poorest achievement in reading and spelling and his best in music and physical education. The teacher is correct in estimating his over-all achievement to be below his 6th grade placement, but she does not estimate it as low as it proves to be when measured by a standardized achievement test.

Under optimum conditions of type size, freedom to use vision aids, and relaxed test time limits he shows an over-all achievement of grade 5.4 when his grade placement is 6.4. His most serious academic weaknesses are in science, social studies and language, where he earns grade equivalents of 4.9, 5.0 and 5.0, respectively. His highest achievement is in arithmetic computation, with a grade equivalent of 5.7.

He has an intelligence quotient of 96. It is likely that a group test was used, which would underestimate his intelligence, at least to a modest extent, if it were administered under standard time conditions. Therefore it might be appropriate to assume that his intelligence quotient is at least 100.

Educationally, the most important feature of the portrait of the typical partially seeing 6th grader is his underachievement. Since his intelligence is probably average, his grade expectancy can be determined by reference to the grade in which he would be for his age. That, for a child of 12 years and 9 months age, should be the end of 7th grade or the beginning of eighth grade, depending upon the minor differences in admission age from state to state. Considering that his actual measured achievement of grade 5.4 was made at mid-term it becomes clear that the youngster is approximately two and one-half years retarded academically, as based on age and mental ability.

The blending of otherwise distinctive elements sometimes blurs important qualities. That may be the case here. It is certainly so with respect to the relative charm of the children's smiles and the freckles on their noses. But the more educationally significant qualities remain clear. If the sketch of the American partially seeing sixth grader is correct in its essentials, certain implications stand out. They are discussed in the next section of the report.

IMPLICATIONS

The results anc conclusions from this investigation have implications for a number of aspects of special education for partially seeing children as well as for other organized activities concerned with the optimum growth and development of visually handicapped children and youth. The major implications are indicated below under four headings: special education practices, teacher education, vocational rehabilitation and research.

Special Education Practices

A main task in special education for the partially seeing is remedial teaching. The serious retardation of such children in all parts of the elementary school curriculum strongly suggests that the most pressing claim on the teacher's time should be for efforts to raise the achievement levels of the pupils. Remediation is needed in the skill areas of reading and arithmetic. It is needed equally or more in content areas such as science, language and social studies. While some tutoring is now done by teachers of the partially seeing, ways need to be found to increase its amount and its effectiveness. More of the teacher's time is required, coupled with heightened efforts to motivate students and to improve instructional procedures.

The great majority of partially seeing pupils can read with no reason to think it will harm their vision and they can use reading materials throughout the type size range of 12 to 24 point type, especially if they are given ample time and freedom to use the optic aids and the reading distance most comfortable for the situation. Therefore the lack of certain instructional materials in a specific type size need not deter the teacher from assigning those materials in whatever type size is available.

Unless there is definite medical evidence that such assignments will be harmful to vision, teachers should give pupils opportunities to use whatever textbooks and other instructional materials are needed to remedy their educational deficiencies.

More time is needed for study by most partially seeing children than is usually needed by non-handicapped children. Deliberate instruction aimed at improving study habits may reduce that need somewhat. With the cooperative home conditions which prevail for such youngsters it may also be feasible to arrange for increased use of homework which is designed by the teacher and implemented by the parents and the children. Thus, the effect of the slower reading rates of partially seeing children may be reduced.

Other efforts need to be directed at reducing the educational handicap occasioned by reduced reading rates. One would be to deliberately attempt to increase reading rates while maintaining high levels of comprehension. There is considerable evidence from studies with non-handicapped children and adults showing that habitual reading rates can be markedly increased through systematic practice, and that such increased rates can be maintained without lessening comprehension.

Goals for pupil achievement need to be set in terms of the best estimates of the learning capacities of the children. Teachers should use information from mental ability tests and should set objectives in terms of achievement expectancy for mental age. Thus the hidden retardation resulting from over-agness for grade will be revealed, and teachers as well as pupils and their parents can be made aware of the real potentialities for achievement that exist. At the same time teachers might well show increased reluctance to accept the assignment of pupils to their special education programs without thorough educational diagnosis and planning for instruction beforehand.

It is possible that some teachers of the partially seeing are not well prepared in the special techniques and understandings of remedial teaching. Since that is so important, such teachers might well inform themselves through independent study or attend professional courses to acquire and learn to use remedial teaching skills. It should be re-emphasized that the skills needed go beyond those commonly included in remedial reading because they must include remedial work in study habits and in content subjects.

While the typical child in this study was admitted to a special education program a little after age seven, perhaps that was not early enough. There may be an unwarranted tendency to enroll already identified partially seeing children in the regular primary grades "to see how they get along" without special education. Another possibility is that serious vision handicaps, though present at an earlier age, do not manifest their educationally significant attributes until the child is in school a while, when they are identified through the child's failure in school. In either event, the consequences are likely to be negative, as evidenced by the serious educational retardation found at the fifth and sixth grades in this study. That kind of retardation does not typically begin in the fifth or sixth grade. It starts much earlier, accumulating bit by bit through the primary and higher elementary grades. The corrective procedure of choice is to nip it in the bud. Thus this investigation's results and conclusions imply strongly the need for increased emphasis on two educational procedures. First is pre-school identification and planning for partially seeing children. The most important parts of the preschool assessment should be a full delineation of the nature, extent and prognosis of the vision disability and a thorough analysis of the educational needs and potentialities of the child. Put together, these should point the way to the second procedure, a special education plan to be initiated when the child begins school. It may be quite appropriate to enroll the pupil in a regular kindergarten or first grade, if that is the best plan for his special education at the time. But it should be a considered decision, with progress being observed and aided as necessary under a special education program, rather than just a placement "to see how he gets along," with special education to be called to the rescue after failure behavior becomes apparent.

The educational handicaps other than those directly associated with the vision disability suggest implications for special education. Some of them, particularly the emotional and social handicaps noted by teachers with considerable frequency, may be concomitants of the academic retardation the children suffer generally. Remediation of academic deficits can have potent positive effects on personal and social attitudes and behavior. Thus it would seem advisable to concentrate on remedial teaching where needed and on the prevention of academic retardation for all partially seeing children from the outset not only because it is educationally desirable but also because it could ameliorate or prevent emotional or social problems.

For those children who show adequate achievement in terms of capacity and who still display social or emotional problems, the conditions should be studied further and attacked according to plans developed from such study. For the children considered by teachers to have educational handicaps in such areas as speech, mental development and hearing the proper diagnostic procedures should be conducted and the special education called for should be applied, in coordination with the special education required on account of partial sight.

The implications of the lack of medical information have particular importance. Data considered highly important by authorities in the field on an a priori basis such as near point acuity, visual fields, and prognosis were frequently not available to teachers. In fact, an adequate analysis of the possible educational relevance of some medical data could not be made because it was not at hand to be studied. On a rational basis some medical information, at least, should provide clues to appropriate educational actions with partially seeing children. So long as teachers have only fragmentary findings about the medical aspects of their pupils' it will not be possible to apply objective procedures to determine their possible relevance in teaching. More extended use of a report form such as that prepared under the auspices of the National Society for the Prevention of Blindness* should go far toward satisfying the present condition of limited knowledge available to the teacher.

The difficulty experienced in this investigation in following children promoted from sixth to seventh grade reinforces comments made by teachers in our correspondence. Partially seeing children appear to be promoted from elementary schools to secondary schools with the special education initiated in the elementary grades often not being continued. Knowing the academic retardation of the children and the extent of other educational handicaps reported by teachers, such an abrupt termination of special education must be questioned.

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* May be obtained from the Society, 16 East 40th St., New York, N. Y. 10016; request Appendix B, Eye Report for Children with Visual Problems.

There are no relationships of very substantial educational significance which have been demonstrated among type size, visual acuity, visual disability and achievement, and reading speed and comprehension are not related importantly to the first three. Thus teachers of partially seeing children are free to press forward with whatever educational tools and methods seem appropriate to deal with the major problem of their pupils' educational retardation.

Vocational Rehabilitation

Serious academic retardation is found among partially seeing children as they approach the age when vocational rehabilitation services become available to them. Therefore partially seeing children may pose more difficult vocational rehabilitation problems because of the increased tendency of academically retarded students to drop out of secondary school or, if they do not drop out, to become ineligible for the kinds of curricula which might prepare them best for occupations in keeping with their true potentialities. It is frequently possible for vocational rehabilitation counseling services to be furnished beginning at age fourteen. Persons responsible for the education of the partially seeing might well arrange for coordination with rehabilitation counselors in the late elementary and early secondary school years, thus bringing to bear another helpful approach to determining which secondary school curricular options are selected in the light of vocational planning.

The fact that the medical information in the records of the teacher is limited can have particularly important implications for the rehabilitation counselor. A significant component in determining eligibility for service is the medical diagnosis and prognosis. The teacher of the partially seeing will likely find a helpful ally in the rehabilitation counselor when putting forward the case for more complete medical information on all pupils.

Teachers indicated that partially seeing children often had other handicaps (i.e., speech, hearing, orthopedic) which added to their educational difficulties. Such information can be of significance in considering vocational rehabilitation since a composite of disabilities, some perhaps minor but all contributing to the total handicap, can sometimes result in a more difficult problem than only one well-defined disability, even though it is severe.

Teacher Education

The review of research on the school achievement of partially seeing children revealed remarkably few efforts to evaluate the process and the outcomes of special education. The same was true of research regarding type size to be used for instructional materials. At the same time when asked to cooperate in this investigation teachers proved most willing to do so, often going to considerable inconvenience to be helpful. If the needed educational research is to be done it seems probable that teacher-education programs will need to give more attention to developing research competencies in teachers as part of their preparation. It is doubtful, too, if the needed competencies can be developed by telling teachers-in-training about the research which has been done in the hope of producing the ability to use research, that is, to be a "good consumer" of research. That is not likely to work well because there is not much research to tell them about and what there is has not proven to be very consumable. Instead, it may be more fruitful to conduct critical reviews of all research which is really relevant to the teaching of partially seeing children and to encourage each student to conduct a small research study as part of his professional preparation for teaching.

There seems to be an increasing tendency to prepare teachers to educate both blind (braille reading) and partially seeing (ink-print reading) children. That tendency is one which the investigators endorse. It is necessary, however, to recognize that the body of knowledge and skills and the practicum requirements may need to differ somewhat for the blind and for the partially seeing. The unique physical environment and teaching procedures which Ashcroft (1963) has suggested calling "sight development" or "sight utilization" programs are parts of that body of knowledge and skills of special pertinence to the partially seeing. So is the research competence noted above. And most important, teachers of the partially seeing have been shown by this investigation to need a very high level of preparation in the remedial teaching area, with such adaptations as are made necessary by partial sight. That includes knowledge of the psycho-social dynamics of motivation and educational counseling as well as the instructional materials and procedures utilized with normally seeing children. That knowledge, too, must be used under supervision during training to assure that the teacher of the visually handicapped responsible for teaching partially seeing children is able to apply it effectively. There seems to be good reason, also, for the teacher-trainee of the partially seeing to be given a solid grounding in the elements of educational diagnosis. That is necessary in order that he may diagnose the more common educational disabilities and work effectively on more complex problems with specialists in educational diagnosis, especially those who come in contact with a partially seeing child very infrequently. These same needs (the "sight utilization" environment, the research competence, the remedial teaching, the educational diagnosis) may also be present for teachers preoccupied with blind children, and to whatever extent that is true the preparation has common elements. But whether true or not for blind children, the research reported here clearly implies their significance in the preparation of teachers who will be required to instruct partially seeing children.

Research

All of the educational research done to date with normally seeing children need not be done again with partially seeing children; that would probably be unnecessary and wasteful. What is needed, very much needed, are studies aimed at adapting and applying to partially seeing children what is known about educational diagnosis and teaching, both initial and remedial teaching, with normally seeing children. At the same time there are a number of topics which may be found to be of unique value for the partially seeing if thoroughly studied. Certain of those topics have been highlighted in the results and conclusions of this investigation and several of them are discussed in what follows.

Instruments for educational diagnosis and prognosis need to be adapted for use with the partially seeing. For example, group intelligence tests might be normed for power test or generous time conditions with non-handicapped children so they could be used with confidence with the partially seeing to obtain comparable measures. Such tests would be helpful at all levels, from kindergarten through college. Fortunately an achievement test was found for this study which had that quality built into it. Other group achievement tests should be adapted as required for that characteristic. It would be useful to develop whatever adaptations of vocational tests, personality tests and other tests used in educational diagnosis are required to make them more applicable to partially seeing children, at the same time assuring that the results remain comparable with those of non-handicapped children and youth.

We did not collect material on the socio-economic status, social class nor on the ethnic background of the families of the partially seeing children in our sample populations. Investigations of such data could be instructive both from the standpoint of assisting in understanding their educational retardation, probable motivation levels and aspirations, and special curricular needs.

The fact that there is no reasonably well-recognized universe of partially seeing children for educational purposes markedly limits the generality of research efforts. Special educators may need to enlist the help of census specialists and demographers as well as others in solving this basic problem.

Related to the lack of knowledge on educationally relevant prevalence and incidence data is the question of definition. Anyone who attempts research in this field of special education soon notes that the definition which has historically been a guide to placement (Hathaway, 1959) has two parts, the "20/70 to 20/200" part and the "other conditions" part. The first part does have some parameters, imperfect as they may be, but the second part has virtually none. A thorough analysis of placement actions and their results under the second part might well give rise to researchable questions or hypotheses of potential value in definition development.

The research literature on school achievement among partially seeing children has not ventured into the secondary school level to any important degree. Relatively little seems to be known about the high school careers or the post-secondary school lives of partially seeing persons. The academic deficiencies reported in the elementary schools in this investigation suggest that such youth may continue to have serious problems of under-achievement and, in the post-school years, under-employment. Their total number is so small that their special difficulties may go unnoticed in the larger group of failures and drop-outs. Both educators and vocational rehabilitation specialists might find value in researching the matter.

The regression equation approach to the selection of the type size most suitable for a given pupil has promise in assisting the teacher. The issue is not confined to the type size in which instructional materials might be printed. When satisfactory magnifier-projectors are developed, the reprinting of books in larger type is a step which might be by-passed. But it will still be important to determine the optimum magnification to use with each child at a given time. Thus the identification of measurable variables which can contribute to the pre-selection of a type-size continues to be of interest, to reduce to a minimum the trial and error approach which now must be used. It could be of value to analyze in more detail the gross measures used in this study at the same time that a search is made for other variables which might increase predictive power.

There is still much that might be done about inquiring into the possible educational significance of particular etiologies and characteristics of visual disabilities. Analysis by specific disabilities might be more revealing than by the broader groups employed in this study.

The need for replication was pointed out in connection with the development and use of a regression equation. In a more general sense replication is advisable for most aspects of this study. That is particularly so because of the indefiniteness of the population universe. The investigators urge that additional research be done to check the validity of the findings reported and the conclusions and implications drawn in this report. It is hoped that the next studies will profit from the experiences described and will not only replicate but improve upon the approaches taken in this one.

The data bank accumulated in the process of the work reported here is available on cards and tapes. There are literally dozens of research questions to which the data could be responsive. The material is available for use by other investigators under conditions to be determined by the nature of each request made.

DATA BANK

All information collected in the investigation, with the exception of anecdotal material supplied by teachers, was keyed and punched on cards. Certain additional information not called for in this study but of interest to the investigators and of potential value to educators of partially seeing children was collected and punched on cards at the same time. It was possible to do that without additional cost. The resulting data bank is available to interested investigators under conditions to be determined by the nature of each request.

APPENDIX A

PROJECT CONSULTANTS

APPENDIX A.

PROJECT CONSULTANTS

The following persons served as consultants to the project:

Dr. William Asher, School of Education, University of Pittsburgh

Dr. Donald Cleland, School of Education, University of Pittsburgh

Miss Evelyn Eisnaugle, State Department of Education, Columbus, Ohio

Mrs. Helen Fields, New York City Schools, New York, New York

*Miss Helen Gibbons, National Society for the Prevention of Blindness, New York, New York

Miss Ruth Hawkins, Pittsburgh Public Schools, Pittsburgh, Pennsylvania

Mr. Oliver Helmrich, Wilkinsburg Public Schools, Wilkinsburg, Pennsylvania

*Mr. John W. Jones, U. S. Office of Education, Washington, D. C.

Miss Elinor Long, State Department of Education, Harrisburg, Pennsylvania

Dr. Murray McCaslin, School of Medicine, University of Pittsburgh

Dr. Alton Kloss, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania

Dr. Alexander Krieger, School of Medicine, University of Pittsburgh

Mrs. Ferne Root, American Foundation for the Blind, New York, New York

Dr. Godfrey D. Stevens, School of Education, University of Pittsburgh

* Special assistance was given by Miss Gibbons and Mr. Jones in estimating the number of partially seeing children receiving special education in the United States and in the selection of states to be used in determining the population of the study.

APPENDIX B.

PROJECT ON SCHOOL ACHIEVEMENT AND
EFFECT OF TYPE SIZE ON READING IN VISUALLY HANDICAPPED
CHILDREN

University of Pittsburgh
Special Education and Rehabilitation
Pittsburgh 13, Pennsylvania

PERSONAL PUPIL DATA SHEET

TO THE TEACHER: This data sheet should be completed for each partially-seeing child you have enrolled in 5th or 6th grade. Place the response to each item in the column at the right, marked [illegible]. Where possible simply indicate the response by a number in the responses below.

The data you furnish will be kept confidential. If you are uncertain as to what data is requested for any item, [illegible] the question [illegible] to the project office.

1. Teacher Information: RESPONSE COLUMN

APPENDIX B

PERSONAL PUPIL DATA SHEET

Last Name ____________________

First Name ____________________

School Address of Teacher ____________________
(Name of School)

____
(Number, Street)

____
(City, State)

2. Pupil Information:

Last Name ____________________

First Name ____________________

Birthdate ____________________
(Month-Day-Year)

Name of School ____________________

School Address ____________________
(No., Street)

____
(City, State)

Form B-1

APPENDIX B.

PROJECT ON SCHOOL ACHIEVEMENT AND EFFECT OF TYPE SIZE ON READING IN VISUALLY HANDICAPPED CHILDREN

University of Pittsburgh
Special Education and Rehabilitation
Pittsburgh 13, Pennsylvania

PERSONAL PUPIL DATA SHEET

TO THE TEACHER: This data sheet should be completed for each partially-seeing child you have enrolled in 5th or 6th grade. Place the response to each item in the column at the right, marked response. Where possible simply indicate the response by a number in the response column.

The data you furnish will be kept confidential. If you are uncertain as to what data is requested for any item, write for further interpretation to the project office.

1. Teacher Information: RESPONSE COLUMN

Last Name

First Name

School Address of Teacher (Name of School)

(Number, Street)

(City, State)

2. Pupil Information:

Last Name

First Name

Birthdate (Month-Day-Year)

Name of School

School Address (No., Street)

(City, State)

Form D-1

RESPONSE COLUMN

3. Child resides with (Indicate by number): ____________________
1. Natural parents
2. Parents by adoption
3. Relatives____________________
(Specify)
4. Foster Home
5. Other____________________
(Specify)

4. The relationship between the child's home and school is (Indicate by number): ____________________
1. Very cooperative
2. Mildly cooperative
3. Uncooperative
4. Unknown

5. Educational Program Information (Indicate by number): ____________________
1. Full time special class
2. Cooperative special class
3. Resource room
4. Itinerant teacher
5. Teacher consultant
6. Other____________________
(Specify)

6. Indicate number of years the child has been in a Special Education Program, to the best of your knowledge. ____________________

7. Record the most recent I.Q. score on the pupil in the response column. ____________________

8. Record the year the most recent intelligence test was given in the response column. ____________________

9. Indicate (by number) the most recent intelligence test given: ____________________
1. Stanford-Binet
2. Wechsler
3. Otis
4. Kuhlman-Anderson
5. California Mental Maturity
6. Lorge-Thorndike
7. Columbia Mental Maturity
8. Other____________________
(Specify by Title)

10. Indicate the grade in which child is currently enrolled. ____________________

Form D-1 (page 2.)

RESPONSE COLUMN

11. Regardless of grade in which the child is enrolled presently, at what grade level is he working in each of the following curricular areas? Indicate to the nearest grade:

Reading ______________

Spelling ______________

Arithmetic ______________

Science ______________

Social Studies ______________

Music ______________

Art ______________

Physical Education ______________

12. In terms of teaching this pupil, which of the following visual disabilities causes the greatest educational problems. ______________

1. Fatigue
2. Cannot see complete words
3. Seating changes needed due to peripheral vision
4. Decrease of normal lighting required
5. Increase of normal lighting required
6. Rest periods required
7. Physical activity is restricted
8. Eye use is restricted
9. Does not have distance vision, cannot see blackboard, movies; to play in physical education games, to cross streets
10. Other______________________________
(Please describe)

13. Visual acuity with correction:

Near Point Left 14/______________

Right 14/______________

Far Point Left 20/______________

Right 20/______________

14. Degrees of Visual field:

Right (state degrees)______________

Left (state degrees)______________

Form D-1 (page 3.)

RESPONSE COLUMN

15. **Visual Acuity Certified by (Indicate by Number)** ________________

1. Physician (other than Ophthalmologist)
2. Ophthalmologist
3. Optometrist
4. Nurse
5. Other________________________
(Specify)

16. **Age of known onset of disability:** ________________

17. **Diagnosis of visual problem (s). Check the condition or conditions:**

	Right Eye	Left Eye	Both Eyes
Albinism			
Amblyopia			
Astigmatism, Hyperopic			
Astigmatism, Myopic			
Cataract			
Choriorentinitis			
Corneal Scars			
Dislocated Lens			
Enucleation			
Glaucoma			
Hyperopia			
Keratitis			
Muscle Imbalance			
Myopia			
Nystagmus			
Optic Atrophy			
Ptosis			
Retinal Degeneration			
Retrolental Fibroplasia			
Retinal Detachment			
Retinitus Pigmentosa			
Other______________ (Specify)			
Not known to teacher			

18. **Is disability: (Indicate by Number)** ________________

1. Progressive 2. Stable 3. Do not know

19. **Does child have other handicaps?** ________________
(Indicate by number)

1. Hearing 6. 6. Social
2. Speech 7. Emotional
3. Orthopedic 8. Cosmetic
4. Intellectual 9. Other ______________ (Specify)
5. Health______________________
(Specify nature of handicap)

RESPONSE COLUMN

20. Which visual or instructional aids are used by the child? (Indicate by number (s)

____

____

____

1. Glasses
2. Low vision aid____________________________
   (Briefly describe)
3. Magnifier
4. 24 point type
5. 18 point type
6. Smaller than 18 point type
7. Standard print
8. Paper guide
9. Pencils or pointers
10. Braille
11. Other____________________
    (Specify)

21. Other descriptive information you may wish to include: (Please feel free to tell us of any condition or situations you have observed which might have significant effect on the educational practices you use with the child.)

APPENDIX C

EXAMPLE OF RETURN OF TEST INFORMATION TO TEACHERS

CDS

APPENDIX C

EXAMPLE OF RETURN OF TEST INFORMATION TO TEACHERS

PUPIL INFORMATION

Name ____
Last Name First Name Initial

Boy ______ Girl ______ Grade ________ Teacher ________________

School ________________________ Date of Testing ________________
Yr. Mo. Day

City Wilkinsburg Date of Birth ________________
Yr. Mo. Day

State Pennsylvania Age ________________
Yrs. Mos.

Stanford Achievement Test Results (To Be Completed by Teacher)

	RAW SCORES	
	Timed	Untimed
1. Word Meaning		
2. Paragraph Meaning		
3. Spelling		
4. Language a. Usage		
b. Punct.		
c. Cap.		
d. Dict. Skls.		
e. Sent. Sense		
5. Arith. Computation		
6. Arith. Concepts		
7. Arith. Applications		
8. Social Studies a. Content		
b. Study Skills		
9. Science		

APPENDIX D

INFORMATION FOR TEACHERS ON THE PROJECT

APPENDIX D

INFORMATION FOR TEACHERS ON THE PROJECT

SCHOOL ACHIEVEMENT AND THE EFFECT OF TYPE SIZE ON READING IN VISUALLY HANDICAPPED CHILDREN

A Cooperative Research Project Between
The Cooperative Research Branch
United States Office of Education
and
The Program In Special Education and Rehabilitation
University of Pittsburgh

The Program in Special Education and Rehabilitation
School of Education
University of Pittsburgh
Pittsburgh, Pennsylvania 15213

SCHOOL ACHIEVEMENT AND THE EFFECT OF TYPE SIZE ON READING IN VISUALLY HANDICAPPED CHILDREN

Description of Study

1. **Purpose:** The purpose of this investigation is to collect and analyze data to the end that (1) the school achievement of partially-seeing children will be known and understood, and (2) so that criteria can be established for type size to be used in specially prepared instructional materials.

2. **Definition of Terms:** In this study, "partially-seeing" is defined to include all visually handicapped children who use ink print as a major mode of instruction. Partially seeing children generally are defined as those with visual acuity between 20/70 and 20/200 in the better eye with optimum correction and others with visual disabilities who, in the opinions of eye specialists, can benefit from similar special education facilities. The above definitions will include children who are designated as legally blind but who have sufficient vision to also use ink print as a major mode of instruction.

3. **Sample:** Approximately 1,000 partially-seeing children receiving special education services in grades five and six will be studied using specially prepared materials. A control group of approximately 200 visually normal children, also enrolled in grades five and six, will be tested for purposes of comparison.

4. Testing Instruments: Five forms of the reading subtests of the Metropolitan Achievement Test have been given to each child. One form was printed in each type size, 12, 15, 18, 21, and 24 print respectively. Using the findings of these tests as criterion measures to establish optimum type size for each child, the 1964 revision of the Stanford Achievement Test will then be administered in that type size. This new revision of the Stanford Achievement Test is not yet available to the general public and would, therefore, not have been previously administered to these children. This test's design and content is more in keeping with current curricular procedures, and therefore has many advantages over previous editions.

5. Schedule: (a) August, 1963, through December, 1963: Sample selection, preparation and distribution of testing materials.

(b) January, 1964, through November, 1964: administration of tests by teachers and scoring by project staff.

(c) June, 1964, through July, 1965: analysis of data and preparation of final report.

6. Significance of Findings: The information derived from this study can well represent the prime source of objective evidence and, consequently, knowledge needed by special educators for the selection of curricular materials for a given child in light of his visual disability and acuity.

Investigators: Jack W. Birch, Professor

William J. Tisdall, Assistant Professor

Ralph L. Peabody, Research Associate

School of Education
Program in Special Education and Rehabilitation
University of Pittsburgh
201 Forbes-Craig Hall
Pittsburgh, Pennsylvania 15213

INFORMATION TO TEACHERS

This is being sent to you with the full endorsement of your State Education Agency and the administrative officials of your school system. This project, sponsored by the United States Office of Education, is also endorsed by the National Society for the Prevention of Blindness, Inc., and the Council for the Education for the Partially Seeing.

The basic purpose of this investigation is to collect and analyze data to the end that:

1. The school achievement of partially seeing children will be known and understood.
2. Criteria can be established for type size to be used in specially prepared instructional materials.

Teachers and others who work with partially seeing children have long been aware of the fact that altogether too little is known about the relationship between type size and school achievement in these children. Although it would seem a relatively easy matter to gain empirical research information regarding this problem, certain complex deterrents have prevented a large scale study such as this one until the present time. A few of these deterrents are as follows:

1. An effective study of this problem requires that we seek information regarding not only the amount or degree of visual impairment, but also the various types of visual impairment.
2. A large scale study such as this, involving some 1,000 partially seeing children in fifteen states, must necessarily require the cooperation of a large number of teachers and pupils.
3. Although tests which are used in this type of a study are straightforward achievement tests, which teachers are familiar with and used to administering, they do require that the teachers and the pupils devote a certain amount of their in-school time.

It is readily apparent, therefore, that if those who work with the partially seeing are anxious to learn more about the educational problems which these children and their teachers encounter, everyone must work together in a strong cooperative effort to accomplish the goals of this much-needed research. The above sponsoring agencies, along with the project staff and your local school administrators, therefore, urge each teacher to cooperate fully in this research project.

The most immediate benefits to teachers and children of this project are two-fold:

1. Within a very short time, teachers will be furnished complete and up-to-date information regarding the school achievement of

their respective pupils. Since the present investigation constitutes the most comprehensive study of school achievement in partially seeing children, the results of these tests should prove to be the most complete achievement information which teachers can have regarding their pupils.

2. The overall findings of this investigation should supply teachers of partially seeing all over the country with more advanced knowledge regarding the school achievements and school programs of the children with whom they work.

In all instances, information derived from this investigation will be kept confidential. Teachers will receive information on their pupils only.

SPECIFIC PARTICIPATION OF TEACHERS*

1. Your pupils have completed the five reading tests. The new 1964 Stanford Achievement Test (complete battery) will be sent to you.

2. The Stanford Achievement Test will be printed in the type size corresponding to that of the reading test on which each child in your group received the highest score. In other words, if you have more than one pupil, one may receive a Stanford Achievement Test in 15 point type while another pupil may be given one in 21 point type or some other size, depending on which type size proved best for the pupil on the reading test.

3. Except for the variation in type size, the Stanford Achievement Tests will be the same for all children. They may be administered to all of your fifth and sixth grade pupils at the same time, if that is convenient for you.

4. Direction manuals for administering the tests will be sent along with the tests. Also included is a supplementary instruction sheet.

5. On the Stanford Achievement Tests the children are to be tested under timed and untimed conditions. This means that when time limits indicated in the manual are reached, children will be asked to make an X next to the number of the item on which they are working when they reach the time limit. Teachers will then ask the children to go on and finish as many items as they can for ten more minutes or until they complete all items. Each reading test may be administered in two sittings and should not usually require over three hours altogether. The complete Stanford Achievement Test may be administered in five sittings, each sitting taking approximately one hour.

6. With each group of tests, you will be supplied with envelopes and postage for returning them to the project office as soon as they are completed.

---

* In some cases, school psychologists will administer tests rather than teachers.

Requested Participation of Teachers

A. Teachers will be asked to administer the tests under both timed and untimed conditions. The tests to be given are standard achievement tests which teachers are accustomed to administering. Direction manuals and supplementary detailed instructions will be supplied to teachers along with the test forms.

B. Directions and stamped envelopes for mailing materials back to the project staff will be supplied to the teachers.

C. Occasional additional communication directly with certain teachers will probably be necessary to accommodate problems as they might arise or as additional data might prove necessary. This will be done at the expense of the project, either by correspondence or telephone.

Services Provided by the Project Staff

A. The entire cost of testing, mailing, and scoring will be borne by the project.

B. All testing materials and data collection forms will be furnished by the project staff.

C. Scoring of tests and the analysis of data will be done by the project staff.

D. Results of tests taken by the children will be sent only to their respective teachers. All information will be kept in complete confidence. The results of the individual pupil's tests will be returned to the teachers if at all possible within two weeks after the completed tests are received in the Project Office.

E. Summaries of the data for your state and for all the states as a group will be sent to you as soon as the data are completed in the Project Office. No data from any state as such will be made available to any other state.

F. Final reports of this investigation will be made available to all participants.

All written or telephone inquiries and requests for further information can be made to:

Dr. William J. Tisdall or Mr. Ralph L. Peabody
Special Education and Rehabilitation
University of Pittsburgh
201 Forbes-Craig Hall
Pittsburgh, Pennsylvania 15213

Telephone: 621-3500, extension 513

APPENDIX E

SUPPLEMENTARY MAT INSTRUCTIONS TO TEACHERS

APPENDIX E

SUPPLEMENTARY MAT INSTRUCTIONS TO TEACHERS

SUPPLEMENTARY INSTRUCTIONS TO TEACHERS

1. Keep the attached Directions for Administering manual. It is to be used for this and the next four reading tests which will be sent to you one form at a time throughout the next few months.

2. Be sure to complete the blanks on page 30 and the last page of the test booklet for each child for each test that is taken.

3. Do not score the tests. Scoring will be completed by the project staff and results will be returned to you.

4. Although the Directions for Administering manual includes directions for more than reading (arithmetic and social studies) you are asked to administer only the tests included in the first two sittings. You will not receive the arithmetic and social studies portions of the Metropolitan Test.

5. The Directions for Administering manual is to be altered in the following way:

   > On each subtest of both the reading and the Stanford Achievement Tests the children are to be tested under timed and untimed conditions. This means that when time limits indicated in the manual are reached, children will be asked to mark an X next to the number of the item on which they are working when they reach the time limit. Teachers will then ask the children to go on and finish as many items as they can for ten more minutes or until they complete all items.

6. Because of the reproduction processes involved in the printing of the large type test booklets, you will note that the page numbers in the test booklets do not correspond with those stated in the Directions for Administering manual. Therefore, please substitute the proper page number in the test booklets when giving oral directions to pupils. An extra test booklet is included for your reference when administering tests. (This extra test booklet need not be returned to the project office.)

7. If for any reason (such as inability to read a particular size of type), a child cannot complete any of the forms of the reading test, please complete the last page of the test booklet and indicate the reasons at the bottom of the page.

8. You are urged to administer this and subsequent tests to your pupils and return them as soon as possible. The importance of maintaining the testing schedule cannot be overemphasized.

APPENDIX F

INITIAL LOCATION OF PARTIALLY SEEING SUBJECTS

INFORMATION SHEET

When the information requested below has been added to this sheet, please use the attached stamped envelope to return it to the project office at your earliest convenience.

1. Name of school system ____________________

2. Name of school official granting permission for administration of tests:

____

Address: ____________________

3. Name(s) of teacher(s) School address Number of partially sighted pupils

Grade 1 Grade 1

APPENDIX F

INITIAL LOCATION OF PARTIALLY SEEING SUBJECTS

(Please use reverse side if more space is needed to record names and addresses of teachers and number of pupils in each grade.)

4. Any special considerations you may wish to call to our attention:

____

____

____

APPENDIX F

INITIAL LOCATION OF PARTIALLY SEEING SUBJECTS

INFORMATION SHEET

When the information requested below has been added to this sheet, please use the attached stamped envelope to return it to the project office at your earliest convenience.

1. Name of school system ______________________________

2. Name of school official granting permission for administration of tests:

   ____

   Address: ______________________________

3. Name(s) of teacher(s) School address Number of partially sighted pupils

Name(s) of teacher(s)	School address	Number of partially sighted pupils Grade 5	 Grade 6
____________	____________ ____________ ____________	________	________
____________	____________ ____________ ____________	________	________
____________	____________ ____________ ____________	________	________
____________	____________ ____________ ____________	________	________

(Please use reverse side if more space is needed to record names and addresses of teachers and number of pupils in each grade.)

4. Any special considerations you may wish to call to our attention:

   ____

   ____

   ____

APPENDIX G
REQUEST FOR PERMISSION TO TEST STUDENTS IN FALL 1964

UNIVERSITY OF PITTSBURGH
SCHOOL OF EDUCATION
PITTSBURGH, PENNSYLVANIA 15213

203 Forbes-Craig Hall

Dear

A cooperative research project between the United States Office of Education and the University of Pittsburgh was inaugurated last year as an investigation of school achievement and the effect of type size on reading in visually handicapped children. This project is nationwide in scope. It calls for the testing of some [illegible] ninth grade partially-seeing pupils in fifteen states and the District of Columbia. Enclosed is a brief description of the project for your information.

Our records indicate that one or more children who took part in this project during the past school year (1963-64) were enrolled in your school district. Since the testing program has not been completed as yet, we ask for your cooperation and that of the teachers in whose classes these pupils are located.

APPENDIX G

REQUEST FOR PERMISSION TO TEST STUDENTS IN FALL 1964

With your permission we would like to send an established edition of the Stanford Achievement test to the teachers for administration to those children who are subjects in this study. The test which will be sent will be in a type size in which given pupils performed best in the previous testing program.

The entire financial burden will be borne by the project, and the cost in teacher and pupil time will be minimal in proportion to the improvements in instruction and pupil learning that can be direct and immediate results. I am quite certain that you will agree that the results of such a study will be of great value to visually handicapped children and their teachers throughout your district and the nation.

Below are the names of the children who must be tested during this final phase in order to assure successful completion of the project. Also included are information sheets for recording the necessary information to be returned to the project office at your earliest convenience.

Unless otherwise indicated by you, we will then send the testing materials and further instructions directly to the teachers involved.

Your cooperation and that of these teachers of the visually handicapped is deeply appreciated.

Sincerely yours,

William J. Tisdall
Co-Principal Investigator

APPENDIX G
REQUEST FOR PERMISSION TO TEST STUDENTS IN FALL 1964

UNIVERSITY OF PITTSBURGH
SCHOOL OF EDUCATION
PITTSBURGH, PENNSYLVANIA 15213

203 Forbes-Craig Hall

Dear

A cooperative research project between the United States Office of Education and the University of Pittsburgh was inaugurated last year as an investigation of school achievement and the effect of type size on reading in visually handicapped children. This project is nationwide in scope. It calls for the testing of some 1,000 fifth and sixth grade partially-seeing pupils in fifteen states and the District of Columbia. Enclosed is a brief description of the project for your information.

Our records indicate that one or more children who were tested in this project during the past school year (1963-64) have moved to your school district. Since the testing program has not been completed as yet, we ask for your cooperation and that of the teachers in whose classes these pupils are located.

With your permission we would like to send an experimental edition of the Stanford Achievement test to the teachers for administration to those children who are subjects in this study. The test which will be sent will be in a type size in which given pupils performed best in our previous testing program.

The entire financial burden will be borne by the project, and the cost in teacher and pupil time will be minimal in proportion to the improvements in instruction and pupil learning that can be direct and immediate results. I am quite certain that you will agree that the results of such a study will be of great value to visually handicapped children and their teachers throughout your district and the nation.

Below are the names of the children who must be tested during this final phase in order to ensure successful completion of the project. Also included are information sheets for recording the necessary information to be returned to the project office at your earliest convenience.

Unless otherwise indicated by you, we will then send the testing materials and further instructions directly to the teachers involved.

Your cooperation and that of your teachers of the visually handicapped is deeply appreciated.

Sincerely yours,

William J. Tisdall
Co-Principal Investigator

APPENDIX H

FOLLOW-UP TO LOCATE STUDENTS TO BE TESTED IN FALL 1964

APPENDIX H
FOLLOW-UP TO LOCATE STUDENTS TO BE TESTED IN FALL 1964

UNIVERSITY OF PITTSBURGH
SCHOOL OF EDUCATION
PITTSBURGH, PENNSYLVANIA 15213

203 Forbes-Craig Hall

Dear

During the 1963-64 school year partially seeing children from schools in your district participated in a Cooperative Research Project entitled, School Achievement and The Effect of Type Size on Reading in Partially Seeing Children.

In order to complete the project it is essential that we locate all of the participating pupils so that we may send the final testing materials to them. This will consist of one form of the Stanford Achievement Test. Some of the pupils have moved to new schools or new school districts and their former teachers were unable to provide us with addresses.

We would appreciate any information you can provide concerning the new school addresses of the pupils listed, as well as the names of their present teachers. A form for recording this information and a stamped return envelope is enclosed.

Thank you for your cooperation.

Sincerely yours,

William J. Tisdall
Co-Principal Investigator

INFORMATION SHEET

School Location of Pupils to be Tested During Fall of 1964

Below please indicate the school location for each of your pupils who have been tested as subjects in the research project on school achievement and the effect of type size on reading in partially seeing children. These are the pupils who have been given each of the five forms of the Metropolitan Reading-Language Test.

Note: Where a pupil has moved to a new school district, please also indicate the name of the school administrator under the name of next year's teacher.

School Location as of September, 1964

Name of Pupil	Teacher's Name	Grade Level	Teacher's School Address

Name of present teacher (or person who administered tests)______________

____

School Address:____

Please return this sheet to the project office in the enclosed return envelope as soon as you have all of the necessary information. Please return to: Dr. William J. Tisdall, 920 Schenley Hall, University of Pittsburgh, Pittsburgh, Pennsylvania 15213.

FS-3

INFORMATION SHEET

School Location of Pupils to be Tested During Fall of 1964

Below please indicate the school location for each of your pupils who have been tested as subjects in the research project on school achievement and the effect of type size on reading in partially seeing children. These are the pupils who have been given each of the five forms of the Metropolitan Reading-Language Test.

Note: Where a pupil has moved to a new school district, please also indicate the name of the school administrator in the Teacher's Name Column.

School Location as of October, 1964

Name of Pupil	Teacher's Name	Grade Level	Teacher's School Address

Name and title of person submitting this form ______________________

Address: ______________________

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Please return this sheet to the project office in the enclosed return envelope as soon as you have all of the necessary information.

Please return to: Dr. William J. Tisdall
201 Forbes-Craig Hall
University of Pittsburgh
Pittsburgh, Pennsylvania 15213

APPENDIX I

CORRECTION FACTORS FOR METROPOLITAN ACHIEVEMENT TEST

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CORRECTION FACTORS FOR METROPOLITAN ACHIEVEMENT TEST

TABLE OF DIFFERENCES:
Difference between Means of Total Raw Score
By Testing Waves (Computed from random sample with N=50)

Testing Waves	1	2	3	4
2	4.86			
3	6.14	1.28		
4	10.74	5.88	4.60	
5	11.94	7.08	5.80	1.20

Correction terms determined by:

1. Computing $\overline{X}$ scores of samples on 5 tests.
2. Determining differences among $\overline{X}$'s on 5 tests.
3. Adding differences to 1st, 2nd, 3rd, 4th, $\overline{X}$'s,

   e.g., let d = difference between 2 $\overline{X}$'s

   d 1-5 = difference between 1st and 5th $\overline{X}$'s

   d 1-5 = 11.94

   12 added to score of individual on 1st test,

   7 added to score of individual on 2nd test,

   6 added to score of individual on 3rd test,

   1 added to score of individual on 4th test.

APPENDIX J

BEST MAT RESULTS FOR PARTIALLY SEEING CHILDREN

The table in this appendix shows the results by subtests for fifth and sixth graders on the MAT where the test is in the type size on which children earned highest total raw scores. The data in the table should not be used for determining grade equivalents. Raw scores for all five forms of the MAT are combined in the data and such raw scores are not exactly equivalent from form to form. The totals have been corrected for learning between test administrations, but the part scores have not been so corrected. All scores a [illegible]

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Best MAT Results for Partially Seeing Children in Raw Scores

	N	Word Knowledge		Reading		Spelling		Language Usage		Parts of Speech		Punct. & Capit.		Language Study Skls		TOTAL	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Fifth Grade	435	26.3	11.7	20.6	7.6	27.2	11.3	17.8	5.5	5.0	2.6	21.0	6.1	13.9	5.8	129.6	42.4
Sixth Grade	468	32.6	12.1	24.1	8.1	35.3	11.3	20.7	5.4	6.1	2.5	23.8	5.5	16.5	5.5	159.1	41.8
TOTAL	903	29.6	12.3	22.4	8.1	31.4	12.0	19.3	5.6	5.6	2.6	22.5	5.9	15.2	5.8	145.8	44.2

APPENDIX K

DEFINITIONS OF CATEGORIES OF VISUAL ACUITY USED IN THE STUDY

APPENDIX K

DEFINITIONS OF CATEGORIES OF VISUAL ACUITY USED IN THE STUDY

Degree of Visual Acuity in Better Eye After Correction

	Near Point	Far Point
Unknown defect	Visual acuity unknown	Visual acuity unknown
Very mild defect	Visual acuity better than 14/28 in the better eye after correction	Visual acuity better than 20/40 in the better eye after correction
Mild defect	Visual acuity from 14/28 to, but not including, 14/48 in the better eye after correction	Visual acuity from 20/40 to, but not including, 20/70 in the better eye after correction
Moderate defect	Visual acuity from 14/48 through 14/140 in the better eye after correction	Visual acuity from 20/70 through 20/200 in the better eye after correction
Severe defect	Visual acuity less than 14/140 in the better eye after correction	Visual acuity less than 20/200 in the better eye after correction
No measurable defect	14/14	20/20

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